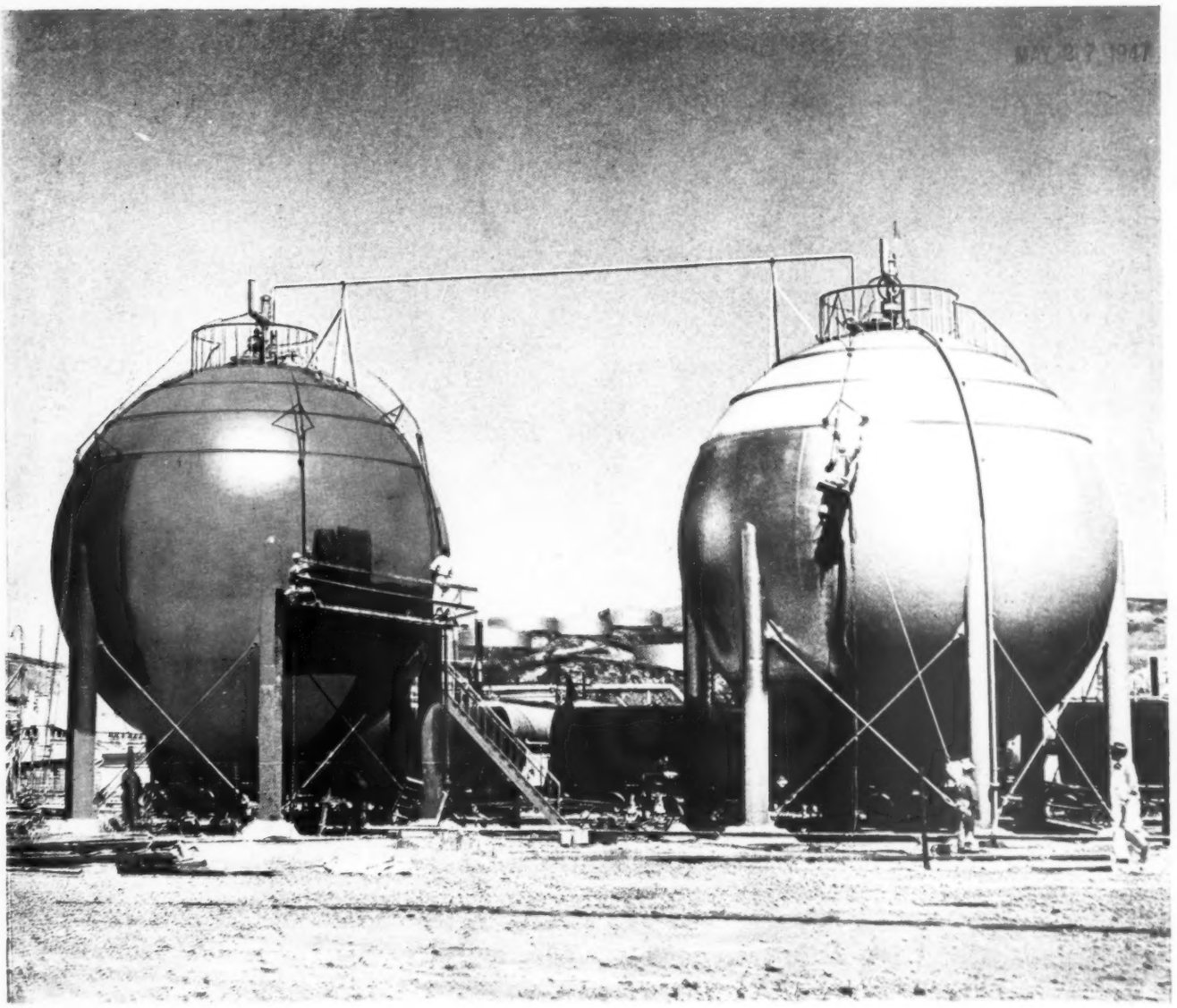
WORLD PETROLEUM

MAY 27 1947



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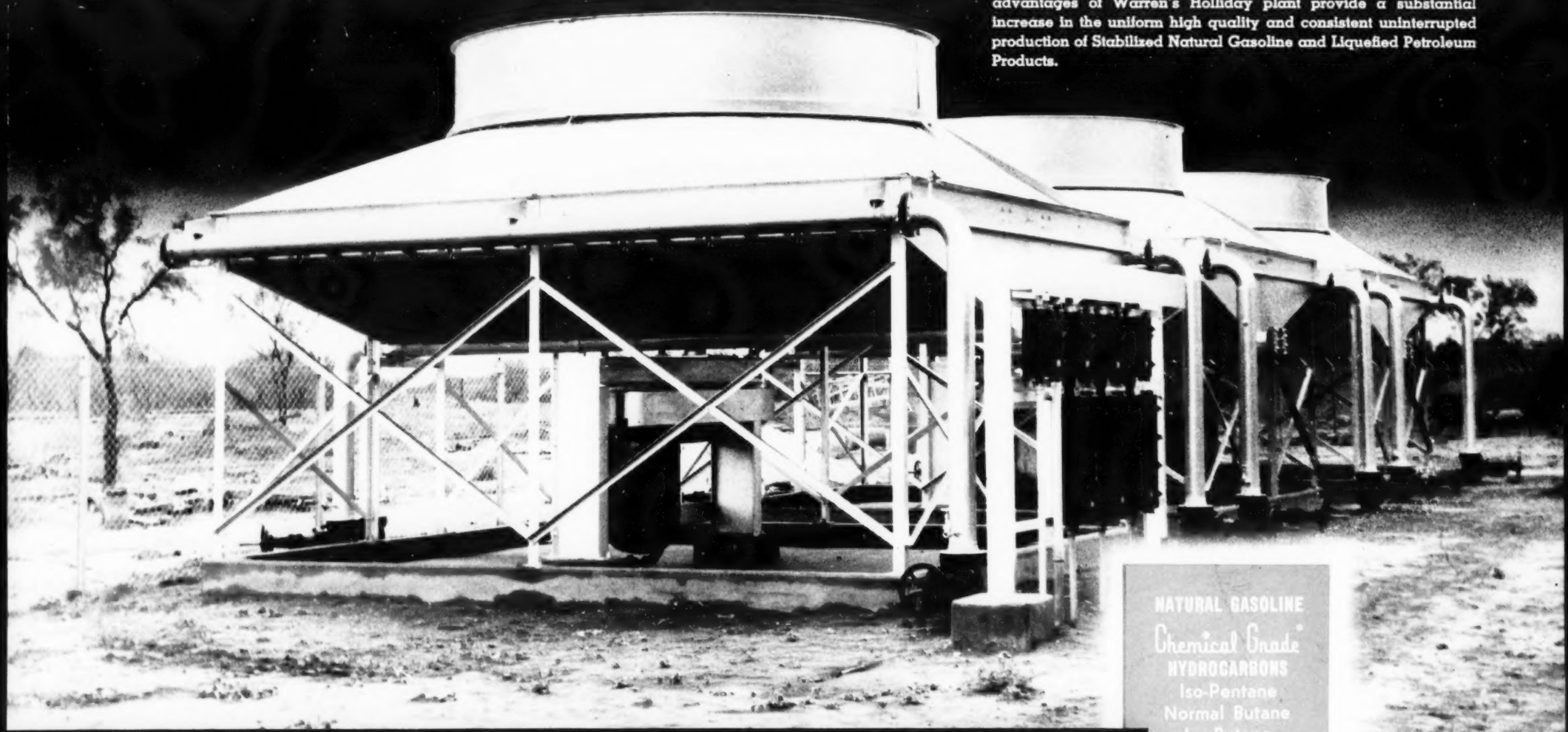

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EDITORIAL

OIL INDUSTRY SEES NO THREAT OF DEPRESSION

WHEN a visitor from the Atlantic seaboard of the United States penetrates westward across the Mississippi, or even beyond the Alleghenies, he is met by one insistent question that greatly puzzles the residents of those not unimportant sections of the country. They want to know the reasoning behind the forecasts of an imminent recession and the basis for the expectation of an industrial debacle that seems to dominate the thinking of the east, particularly in the vicinity of Washington and Wall Street. Explanations received do not appear to be convincing.

Business men of the west and southwest have their problems to contend with. These are troublesome, but they are not of the kind that ordinarily precede an industrial collapse. They are hampered by difficulties in obtaining the goods and materials with which to meet the insistent demands of their customers. Transportation bottlenecks and shortages of ships and railway rolling stock prevent manufacturers from making shipments on schedule. Builders of machinery find their shops and yards cluttered up with products that remain unfinished because of the lack of small but essential parts. A plague of local strikes and work stoppages aggravates this condition. Expansion of industrial growth is retarded by the complete dearth of office and living space and working quarters, yet construction activity is at a peak.

In the petroleum industry, which has its main habitat in this part of the country, conditions are the same as in other lines, except that in some respects the problems are more acute. Production is at an all-time high, yet many refiners are desperately worried about their raw supplies. Despite recent advances in prices, crude that is not under the control of refining companies continues to command premiums. Stocks of finished products are beginning to melt under the seasonal rise in consumption. Exporters are scouring the markets in the effort to fill orders from abroad that are larger and more numerous than they were directly after the close of the war. All present indications point to a new high in activity for 1947 that will be restricted only by the limitations of processing and distribution.

In the closely related field of oil industry equipment, demand likewise has outrun the capacity to meet it. Pipe lines projected for the movement of crude, refined products and natural gas aggregate a mileage greater than ever before, but except in cases where orders were long since placed on the books of fabricators, line pipe is unobtainable for delivery before 1949. In casing and drill pipe, the impasse is a shade less complete, but the makers of tubular goods are allocating their output on the basis of 30 percent or thereabouts. Drilling contractors who have casing and drill pipe are jealously guarding their inventories because it is the man who can supply pipe who gets the job. One effect of the scarcity that is unfortunate from the viewpoint of national conservation is that hundreds of stripper operators are finding it more profitable to pull their wells and sell the equipment at prices now obtainable than to keep them going.

Should a decline in business activity and in demand for industrial machinery take place in the United States from any other cause, the slack in domestic requirements may readily be taken up by closer attention to export demand. Oil operators abroad who were debarred during the war from obtaining drilling machinery, pipe line and refining equipment looked hopefully to this market to meet their accumulated needs after the close of the conflict. To a great degree their hopes have been thwarted by the pre-occupation of American manufacturers with home requirements and their inability to meet these fully. Representatives of oil companies operating in other parts of the world and commissions from governments have toured the country in an effort to place substantial orders, backed by an ample supply of dollars with which to make payment. In some instances they have had to turn to Britain and other European countries that are actively seeking export business to find supplies urgently needed. In others American firms interested in maintaining their export connections have adopted the expedient of allocating a certain proportion of their output to shipment abroad, a policy definitely helpful in the preservation of good will.

So great is the task before the international oil industry in repairing the devastation caused by the war and in carrying out ambitious projects of expansion now under way or planned that years of time and billions of dollars will be required for its execution. While the oil industry is not immune to the influence of factors which create world depressions, there is nothing in the foreseeable future to forecast a decline in demand or to permit at worst more than a very temporary diminution of its present activity.

MINING INTERESTS JOIN N. J. STANDARD IN STUDY OF COAL-OIL CONVERSION

PITTSBURGH Consolidation Coal Company and Standard Oil Company (New Jersey) have agreed to undertake a joint research into the production of liquid hydrocarbons from coal. A $300,000 pilot plant is to be built at Library, Pa., in the Pittsburgh area, where coal gasification studies will be conducted. Thus will begin initial steps in the investigation of methods of producing gasoline, diesel fuel and other hydrocarbons from raw materials of which known reserves in the United States are sufficient to supply the nation's liquid fuel demands for thousands of years. New Jersey company scientists have estimated that if only half the nation's known coal measures are converted to liquid fuels, the remainder being reserved for solid fuel uses, there will be enough oil to last more than 3,000 years.

Studies of coal carbonization already are being conducted at the Disco plant of Pittsburgh Consolidation Coal Company. The new pilot plant at Library will employ fluidized solvents technique in an effort completely to gasify coal. It will be large enough to process about 50 tons of coal daily and produce about 2,400,000 cubic feet of synthesis gas per day. If this synthesis gas were to be processed for liquid hydrocarbon production at Library, the pilot plant would produce about 120 barrels per day of synthetic gasoline. Plant will be near the new research center established by the coal company where raw materials for the plant will be conveniently at hand. It will be ready for operation late this year.

In some quarters, though mainly outside the ranks of the petroleum industry, fear has been expressed recently that domestic oil supplies are on the wane and that the United States soon will become a "have not" nation. There was a good deal of sober discussion of this at the recent annual meeting of the Petroleum Division of the American Institute of Mining and Metallurgical Engineers. Standard Oil Company (New Jersey) officials do not share this apprehension. They think that gasoline from coal is a matter of economics and that it may not be too long before coal will become an active competitor of crude petroleum.

Wallace E. Pratt, retired geologist, said recently that the continental shelf of the United States could yield at least 1,000 billion barrels of oil if necessary. His estimate is based on a study of the shelf's character and an analogy with land discoveries. Thus far 53 billion barrels of oil have been produced from sedimentary rocks having an aggregate volume of less than three million cubic miles. The estimated volume of sediments under the 10 million square miles of continental shelf is about 20 times the volume from which our oil has been produced, Mr. Pratt pointed out.

Speaking at a seminar on fuels of the future at the Esso laboratories, Linden, N. J., recently, Robert P. Russell, president of Standard Oil Development Company, said that there is plenty of oil in sight to last the world 100 years. He suggested, however, that the cost of producing oil from coal may be lowered by research to the point where petroleum which costs too much to find and lift will be supplanted.

In common with other oil companies, New Jersey Standard is devoting a large part of its research expenditures to synthetic fuels. The present percentage is one-third to synthetic fuels and two-thirds to all other projects. At Linden a plant which was used during the war to investigate separation of uranium isotopes has been converted to the study of methods of producing liquid fuels from synthesis gas. This plant currently is producing 15 gallons per day of liquids from gas. At Baton Rouge a much larger pilot plant is producing 20-30 barrels per day of liquid hydrocarbons.

These two plants will continue on their present studies while the new Pittsburgh pilot plant will devote all its time to the production of synthesis gas from coal. Synthesis gas conversion will not be a part of the Consolidation Coal-Standard plant program.

As the new research work is begun, production methods are far enough along so that gasoline could be produced from coal at only five cents more per gallon than from crude oil. Given such a promising start as this, the petroleum industry has found in the past that workable, commercial processes can be perfected in from three to seven years of intensive research. Erection of a commercial plant might thus be possible sometime from 1950 to 1954.

American researchers will not have to make as many mistakes or pursue as many false clues in this study as in some other enterprises. This is because the Allied Technical Oil Mission has surveyed Germany's Fischer-Tropsch plants and the German technical records so carefully. In 350 Allied Mission reports and in 250,000 pages of German technical documents, a wide range of information is available.

While the German data has been valuable in providing background information, the most important element in bringing synthetic gasoline so near to commercial success has been the adaptation of American wartime techniques to the process. These have reduced costs of plant and costs of operation tremendously. A coal-gasoline plant built today would cost on the order of $6,000 per barrel of daily gasoline capacity, which is four times the cost of a modern crude oil refinery of high yield and high-quality product and about double the cost of a natural gas conversion plant for producing synthetic fuels.

By application of fluid catalyst methods, the cooling surface requirements in a synthetic gasoline plane have been reduced more than 99 percent. A German Fischer-Tropsch plant of 10,000 barrels gasoline capacity required 128 reactors. An American plant of equal capacity will require only four.

A 10,000-barrel Fischer-Tropsch plant was equipped with 5.8 million square feet of cooling surface. To carry off the great amount of heat developed by the process, 1.8 million Btu. per barrel of liquid product, Germans built a multiplicity of small reactors, each of which was filled with water tubes surrounded by pellets of catalyst. This contributed to both high first cost for plant and high maintenance cost.

In the American version of the process, there still are water tube coolers but only about enough to produce necessary process steam. The fluid catalyst lies in a deep mass around the water tubes. When the synthesis gas is forced into the bottom of the reactor, the reaction begins at once, but the heat is carried quickly through the bubbling mass of catalyst to the water tubes. The American process operates at much higher temperatures, ranging from 650 to 1000°F.

Another important advance in the American version of the process as developed thus far is a change in catalyst. Iron has been substituted for cobalt with the result that gasoline now being produced at pilot plants has an octane rating of 80 compared with 50 octane gasoline produced in Germany. The higher heat at which the process is conducted probably has some effect on quality, although researchers have not yet determined exactly what the nature of the reaction is. When they get more information on this point, the process development should go forward even more rapidly than it does today.

A third advance which has brought synthetic

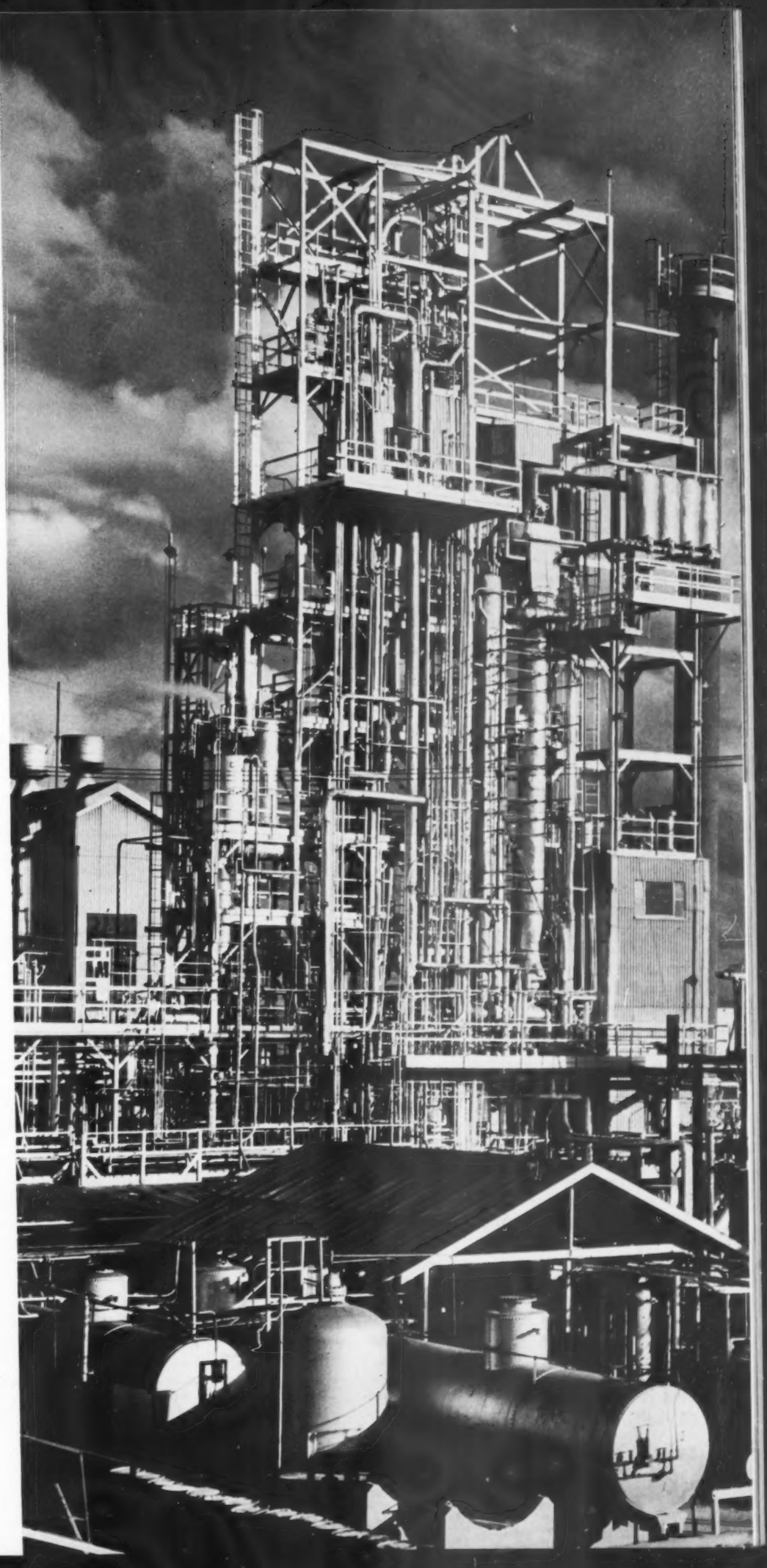
gasoline production from natural gas to a commercial stage has been the development of a method of producing oxygen cheaply. During the war the United States was producing only 38 million cubic feet of gas daily. The largest single plant produced 3.25 million cubic feet. Yet each of the two natural gas synthesis plants now planned will require 75 million cubic feet of oxygen daily. The oxygen will be produced by liquefaction of air at —315°F. and subsequent distillation of nitrogen. Final yield will be about 20 percent of 95 percent pure oxygen.

Fundamentally the natural gas and coal processes do not differ greatly. In the natural gas process, the carbon required for the synthesis gas is in a much more readily available form than where coal must be used as a raw material. It is the difference in the equipment necessary for coal gasification which makes the coal process so much more expensive today. In the gas process the natural gas is burned with a limited amount of oxygen to produce carbon monoxide and hydrogen which is subsequently treated catalytically to produce gasoline, diesel fuel and various alcohols. The coal process produces the synthesis gases, hydrogen and carbon monoxide, by heating the coal with a blast of oxygen in the presence of steam.

In the Pittsburgh research it is proposed to adapt fluidizing techniques to the raw material charged to the coal gas generator. Coal will be ground to pass through a half-inch mesh at the largest, so that it can be blasted with the oxygen and steam to obtain an immediate reaction. Cyclone separators such as are used in fluid catalyst processes can be employed to separate ash from the synthesis gas produced. This is a method which has not been used in the commercial production of water gas by any city gas works.

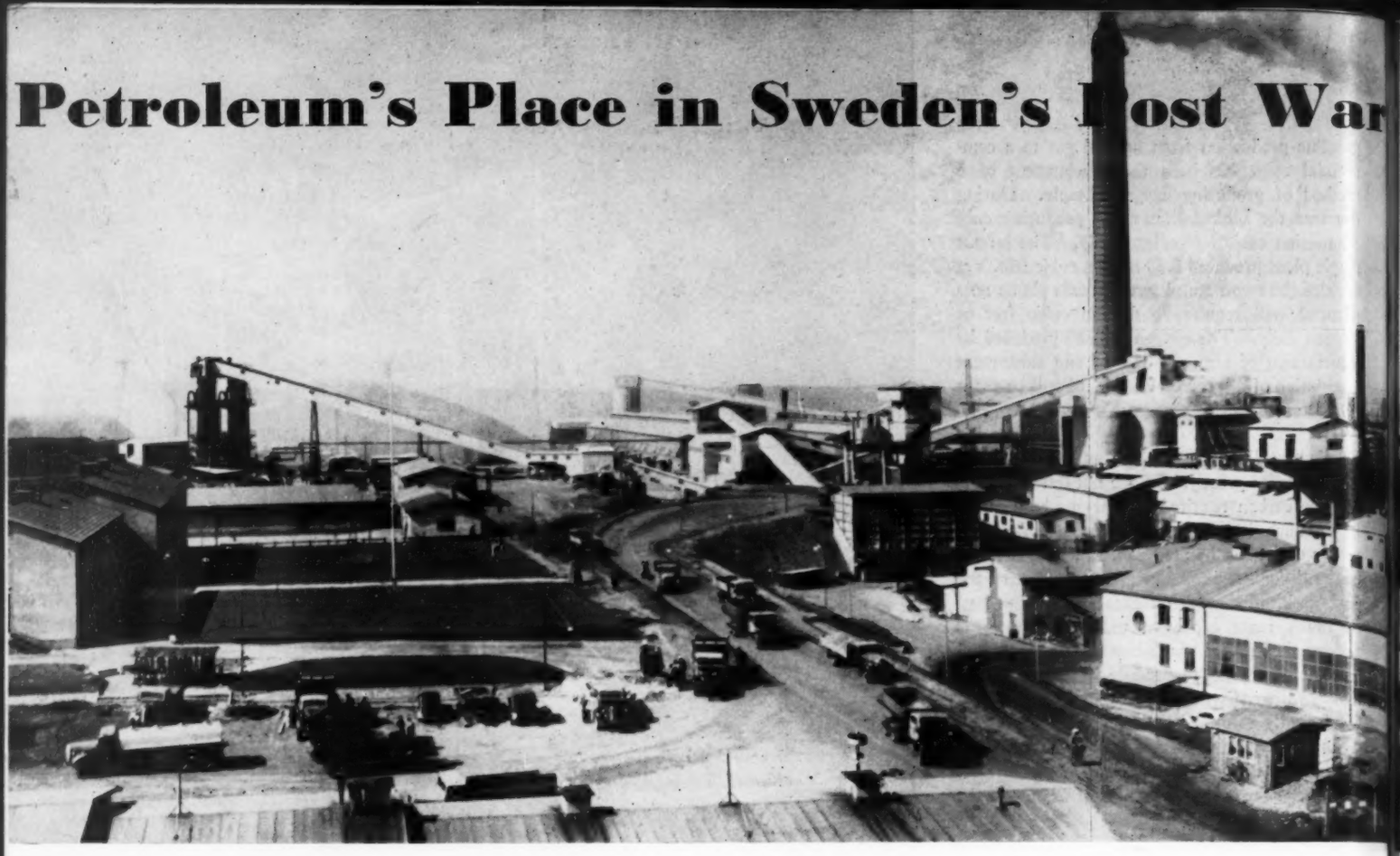
In its present stage of development, the coal process requires 4,200 tons of coal daily to produce 10,000 barrels of gasoline as well as roughly 800 barrels of diesel fuel and 800 barrels of alcohols, plus 40 million cubic feet of fuel gas. Calculated cost of gasoline is 10 cents per gallon at the plant on the basis of coal at $2.50 per ton and assuming a market for the gas and alcohols. The 10-cent figure allows for plant depreciation and amortization but does not allow for a return on the $60 millions plant investment.

Elsewhere in this issue, in an article on the Swedish shale oil industry, there is a brief description of a process which has been developed to produce shale oil without mining. In Alabama experiments are currently being conducted into methods of producing water gas from coal beds without mining. These experiments are being watched with great interest by oil technologists who are working on the synthetic gasoline problem. If coal could be gasified cheaply without mining, the day of synthetic hydrocarbons from coal as competitors of gasoline and diesel fuels produced from petroleum would be at hand.



Standard Oil Co. (N. J.) synthesis pilot plant at Baton Rouge, La. Roberts Photo.

Petroleum's Place in Sweden's Post War



BEFORE the war Sweden was a large importer of coal and a large user of wood as fuel. Much of the coal was imported from Britain. Now that Sweden is emerging from its severe wartime fuel shortage, it appears to be converting its economy from coal and wood to oil. Swedish petroleum imports in 1946, for example, totaled 14 million barrels, compared with an average of 10 million barrels in the three years prior to the outbreak of the war. This is but natural since England is producing less and less coal and is, in fact, promoting the use of oil on British railroads and in industrial installations. British coal exports are not expected to reach prewar levels.

Only one oil refinery was operating in Sweden before the war. It was the A. Johnson & Co. and Nynas Petroleum 12,000 barrel skimming and cracking plant at Nynashamm, near Stockholm. Johnson completed a new 3,000 barrel plant at Malmo last year and is reported about to build another plant at Goteborg where a site has been purchased.

The cooperative organization in Sweden now is considering the erection of a refinery of its own. This plant may be built in Texas and the finished products shipped to Sweden. (WORLD PETROLEUM, April, 1947.)

Most important postwar refinery building project is the plant scheduled for immediate erection by a new company owned by Stora Kopparberg, Inc., an old mineral and chemical company with a charter granted 662 years ago, and Translantic, one of the nation's large shipping companies. The new plant will be erected more quickly than it could be normally because the company has purchased equipment originally built by the United States government during the war for rapid erection in the Dutch East Indies when that area should be liberated from the Japanese. The equipment was declared surplus and sold to the Chinese government in 1945 and now has been resold to the Swedish interests.

The plant consists of two distillation units and two naphtha reformers. The two distillation units consist of foundations and other structural materials, heaters, burners, stacks, heat exchangers, fractionating towers, gas oil strippers, naphtha strippers, stabilizers, cooling boxes, pumps, instruments, piping, steam and electrical power facilities, including buildings, fireproofing and insulating materials and other appurtenances for complete distillation operation. Each of these distillation units is capable of handling about 7,200 barrels of charging stock daily. The two naphtha reforming units are capable of handling approximately 3,000 barrels of naphtha per day and are complete with all necessary auxiliary equipment.

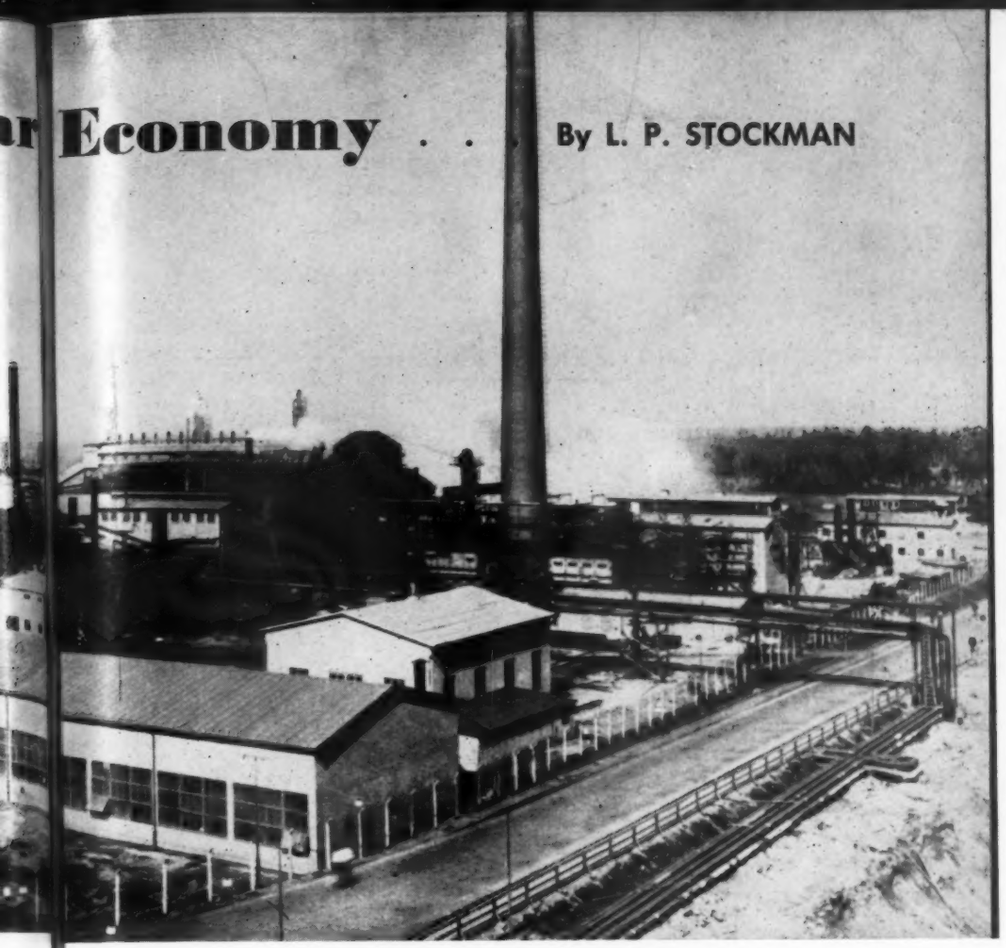
The equipment still was in its original crates when it was purchased from the Chinese. It was designed originally for erection in 30 days after delivery to the operating site. A cat cracker may be added at a later date but is not planned for immediate erection. The equipment now is enroute to the site of Goteborg, a Swedish west coast port which is ice-free the year around.

Decision to erect the new refinery and two pipe lines is the result of a survey and recommendations of Linden & Co., of Los Angeles. The Linden organization procured the refinery equipment and other necessary material. The City of Goteborg will build and operate as a common carrier one four-inch refined pipe line and one eight-inch crude and fuel oil line from Goteborg to Stockholm, a distance of 350 miles. Engineering and supervision of construction will be by Linden for the City of Goteborg. H. W. Wickstrom, vice president of Linden & Co. has been placed in charge of the petroleum division, and will maintain headquarters in Goteborg. These two pipe lines, which will cross the richest industrial section of Sweden, will cost approximately $10 millions. The Port Authority of the City of Goteborg has the support of the Swedish government, and a bill was recently introduced in the Swedish Parliament calling for expropriation of the land needed for rights of way.

Sweden is dependent on other countries for most of its oil and coal. Domestic coal production is only about 430,000 tons per year, and prewar imports of coal were around 8,000,000 tons.

Economy . . .

By L. P. STOCKMAN



Kvarntorp plant of Swedish Oil Company.

Since only one million barrels of oil per year was allowed through the blockade during the war compared wtih ten million barrels before the war, Sweden had to develop other resources and practice rigid economies. Wood production was tripled and supplemented with peat, compressed straw and shale oil. A large proportion of the country's automotive vehicles were equipped to burn gas produced from charcoal. Peat briquets, powder and peat coke were used for domestic heating.

Oil shale deposits in Sweden are considerable but not rich in hydrocarbon content, averaging only 5 to 6 percent. In the Kinne-kleva area it is estimated that 175 million barrels of oil can be recovered, and in the Kvarntorp area about 400 million barrels. The Kinne-kleva shale oil plant built by the government at a cost of about $2.5 millions has been shut down now that the emergency is over. Government policy is expected to be to enlarge and improve the $20 millions Kvarntorp plant to the point where it may be able to compete with foreign oil importations. With the aid of by-products produced from the shale, it has been estimated that the plant can be made profitable by 1951. During the war it was essential that both plants be operated, and the Kvarntorp plant capacity was increased from 30,000 to 600,000 barrels per year.

Extent of Sweden's conversion to an oil economy is seen in the fact that with Kvarntorp operating at capacity in 1946, the nation imported 40 percent more petroleum and its products than before the war. Last year Kvarntorp produced about 220,000 barrels of gasoline, 30,000 barrels of kerosene and 350,000 barrels of fuel oils plus large quantities of gas and coke which were used for fuel purposes in the production of electrical energy and for domestic purposes.

Plans of the Swedish Shale Oil Co. include the manufacture of building materials within the next two years, and by 1950 the company anticipates the production of various by-products exceeding the production of shale oil which should reach 750,000 barrels annually by that time. Present annual production of sulfur approximates 22,000 metric tons. This sulfur is sold to the Swedish pulp industry. Recently two lime units of new design have been erected and, upon completion of the third and fourth units, production of quicklime will reach 60,000 metric tons a year. Some of the gas produced at Kvarntorp is transported to Orebro, which city receives its total gas requirements from the federally owned company. Orebro, however, only requires about five percent of the Kvarntorp gas production, the remainder being used for steam and electricity.

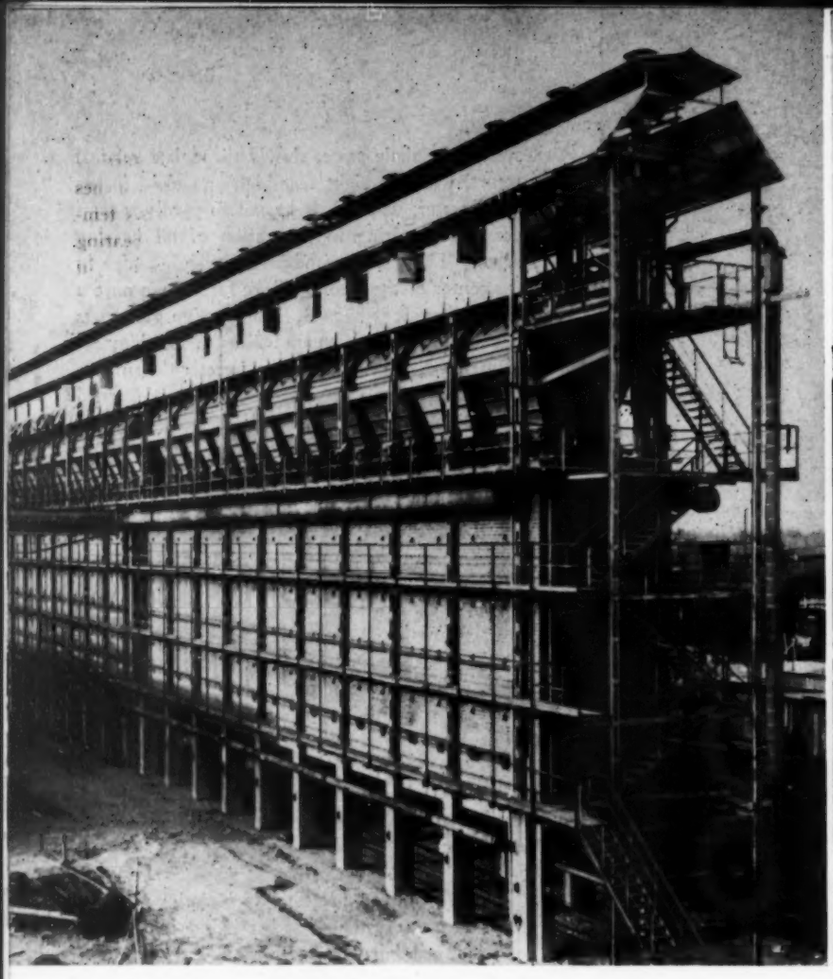
Four methods of handling shale are employed at Kvarntorp. These are the Bergh system, the Rockesholm system, the Industrimetoder system and the Ljungstrom method. In the Bergh system the shale passes slowly through a vertical retort, which is eight feet high and eight inches in diameter, where it is heated to pyrolysis temperature resulting in generation of oil bearing gases. The gas is withdrawn through a pipe in the center of the retort. Coke falls down onto a grate where it is burned. Combustion gases pass out of the retort via steam boilers to the chimney. Contents of the retort receive directly the surplus heat required for the process. Distilled and burned ash is removed continuously by belt conveyor to a dump. The distillation heat is produced by burning the distilled shale coke at a temperature of 800-900°C. in a combustion chamber below the retort. To prevent combustion gases from being absorbed by the oil gases, a certain pressure equilibrium must exist between the oil gases and the chimney draft.

In the Rockesholm system, shale is heated while passing through the retort, and generated pyrolysis gases are withdrawn directly to a condenser. Coke is produced in this system but is not burned. It is quenched with water and transported to a dump. Within a short time, the coke produced by these units will be burned in new Bergh units now in course of construction.

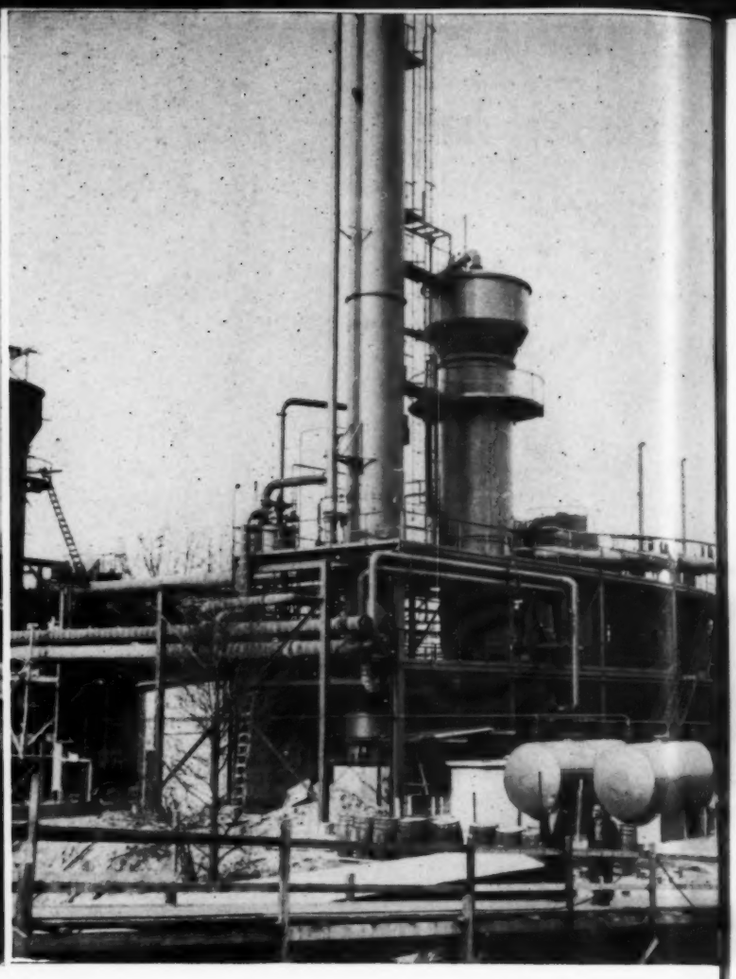
Around each retort in the Rockesholm method, there is a combustion chamber in the lower part of which gas burners are located for combustion of non-condensable gases which gives the heat necessary for the process. Crushed shale is charged to vertical cast iron retorts which are 26 feet long by two feet in diameter. Heating of the retort is so arranged that combustion gases from the gas burners, placed in the bottom of the retort, pass along the outside of the retorts in walled combustion chambers at a temperature maintained at 840°C. By injecting steam at the retort's bottom, considerable gas is obtained. Caustic ammonia, formed during the process, and soluble in the condensation water is transformed to ammonia sulfate.

The Industriometoder system uses two furnaces, each designed to handle a charge of 600 tons of shale daily. The furnace consists of a long tunnel, measuring 200 feet in length and 12 feet in diameter through with cars loaded with shale pass. At each furnace there are three fireplaces where non-condensable gas is burned. The hot flue gases then pass through a bundle of pipes running along the tunnel. The flue gases give off their heat to the shale cars but do not come in contact with the furnace atmosphere.

The pyrolysis gases are withdrawn in the usual manner and charged to a condenser. The coke is not burned but, as in the Rockesholm system, is first quenched with water before being transported to a dump. Part of the breeze obtained is charged to the nodulisation unit. After grinding the shale breeze to powder, breeze powder and water are mixed in a special plant. The mixture is then passed through drums in which balls are formed. These balls are then dried by means of flue gases and are charged into cars



Rockesholm furnaces at Kvarntorp.



Plant for recovery of sulfur from shale oil.

which then pass through one of the IM furnaces.

A coke combustion plant to burn the Rockesholm and IM coke is under construction and will be in operation very shortly. The combustion gases in the IM system do not come into contact with the oil gases as in the Bergh system. In order to increase heat transfer from the heat tubes to the shale, the oil gases inside the still are circulated by means of fans placed on the still's top.

In the Ljungstrom system, the shale is not quarried as is done when using the other three methods but is heated in place. Best results are obtained when the shale is covered with limestone as the heat is retained more satisfactorily. The area to be processed is divided into hexagons with sides 2.2 meters each. Holes are then drilled in the corners of the hexagon and one hole in the center through the strata of earth, limestone and shale. Iron tubes are then inserted in these holes and an electrical resistance is built up in the tubes and insulated by means of quartz-sand from the tube. When in operation the shale is heated in place, and the generated gases flow to the center hole and are collected and run to a condensing unit. When the oil fractions have been condensed, they are pumped into crude oil tanks for further processing. The crude oil thus produced is then passed through a topping plant where gasoline and kerosene are separated from the heavier fuel oil. The gasoline and kerosene fractions are then subjected to refinement with subsequent fractional distillation.

Coke produced at the plant has been very difficult to burn satisfactorily because of high ash content and low sintering temperature. Research, however, has developed a new type Bergh furnace in which heat absorbing elements have been built into the fuel bed with an increase in burning efficiency of some 700 percent.

Heating economy plays a most important role in an industry such as the shale oil works, and it is a matter of course that the greatest utilization of the calorific properties of the shale is essential. Before the coke burning plant was installed, gas production was 7,600 cubic meters, approximately 494,000 cubic feet per hour, of which 6,600 cubic meters, or 432,000 cubic feet, were used for heating the furnaces and for generation and super-heating of steam. This left 1,000 cubic meters which was sold to the Orebro gas works which supplies the town of Orebro with domestic gas requirements. The gas surplus is transported from Kvarntorp to Orebro by a 17 kilometer, 10½ mile, pipe line. Saturated steam production was 46 tons per hour, and by gas firing an additional 21 tons hourly were produced. This 67 tons per hour generated 6,000 kilowatts of electricity.

With full scale operation of the coke burning plant, steam generation was increased to 110 tons per year, 50 tons being yielded by the coke burning unit. This eliminated the necessity of producing steam by gas firing leaving more gas available for sale and for other plant uses. Total effect of the increased steam generation is 5,500 kilowatts, reaction effect and 10,000 condensation effect.

As soon as the remaining Bergh furnaces have been rebuilt the company will begin operation of a plant to produce liquefied gas. This liquefied gas plant is at present under construction. Steam generation will amount to 118 tons of superheated steam per hour, 15 tons of which will be required for operation of the liquefied gas plant and the remainder will be used for generation of 5,000 kilowatt reaction effect and 9,000 kilowatt condensation effect. When all three Bergh furnace houses have been rebuilt, production of gas and liquefied gas will increase further to 2,800 kilograms and 8,000 cubic meters per hour respectively. Generation of steam and electric power will increase considerably so that the electric energy produced at Kvarntorp will be at least 30,000 kilowatt. With the plant completed, a better test of the economic possibilities of shale oil will be possible.

Recent tests have indicated that the Kvarntorp shale contains an undetermined amount of uranium. A study is being conducted to determine the quantity present and whether it can be removed in sufficient quantities to make the undertaking commercially profitable.

Maine farmer uses tractor in preparing ground for his potato crop. All photographs with this article are reproduced through courtesy of Standard Oil Company (N. J.)

THE AGRICULTURAL DEVELOPMENT PROGRAM OF THE AMERICAN PETROLEUM INSTITUTE

By GEORGE KRIEGER

Agricultural engineer, Ethyl Corporation; Chairman, Agricultural Development Committee, American Petroleum Institute.

THE basic thinking behind the establishment of a farm program by the petroleum industry is simple. We believe that scientific power farming is only just beginning—is in its infancy. What's good for agriculture is good for the United States, and in turn good for the petroleum industry. What benefits the petroleum industry, we promote.

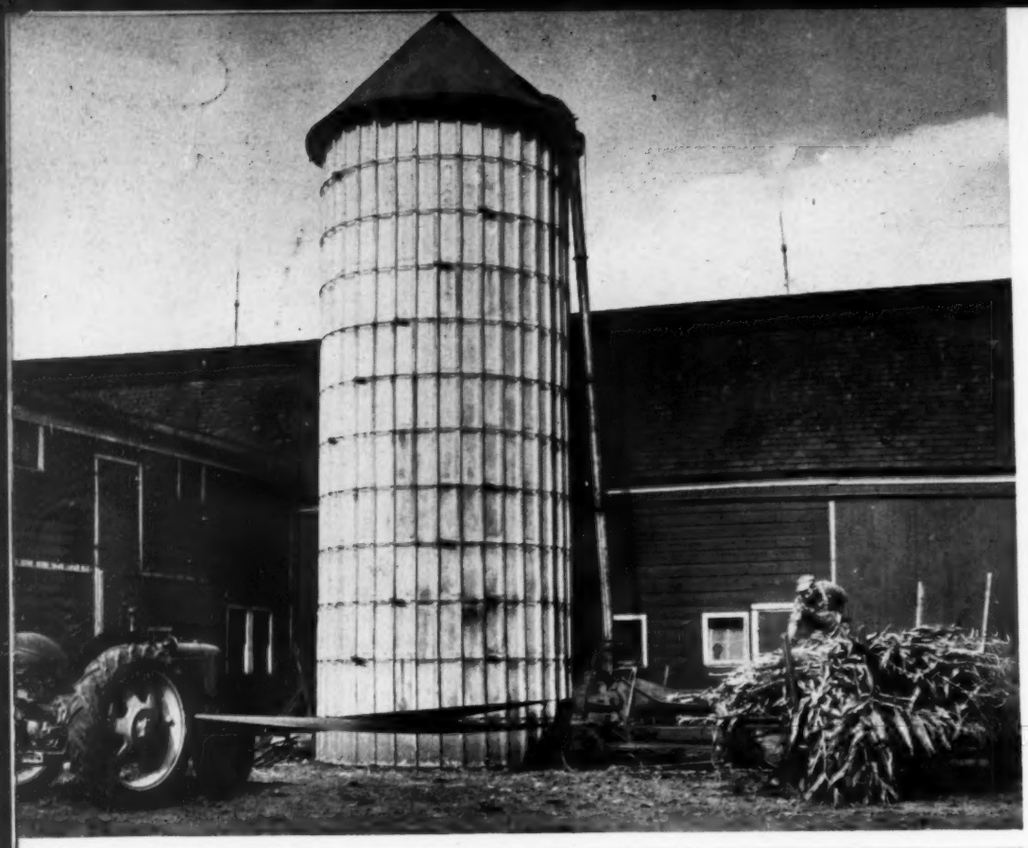
We already have a great wealth of products and services to offer the farmer. We supply much of the fuel that powers his farm, heats his home and takes him to and from markets over many oil-based roads. We supply chemicals and fertilizers, fruit-ripeners, herbicides, insecticides and fungicides and many other new materials and methods that help to improve farm production. It would be dereliction of duty on our part if we did not devote special study and attention to the subject of better serving of this good customer, who produces the food, clothing and shelter for our continued existence. However, the expanding farm market for petroleum products is only one of the many interests of our committee. Another is less obvious and little known, but of increasing importance. If the farmer is to be a good customer of ours, it is to our interest to see that he has a good market for his products. Agricultural development depends upon farm income.

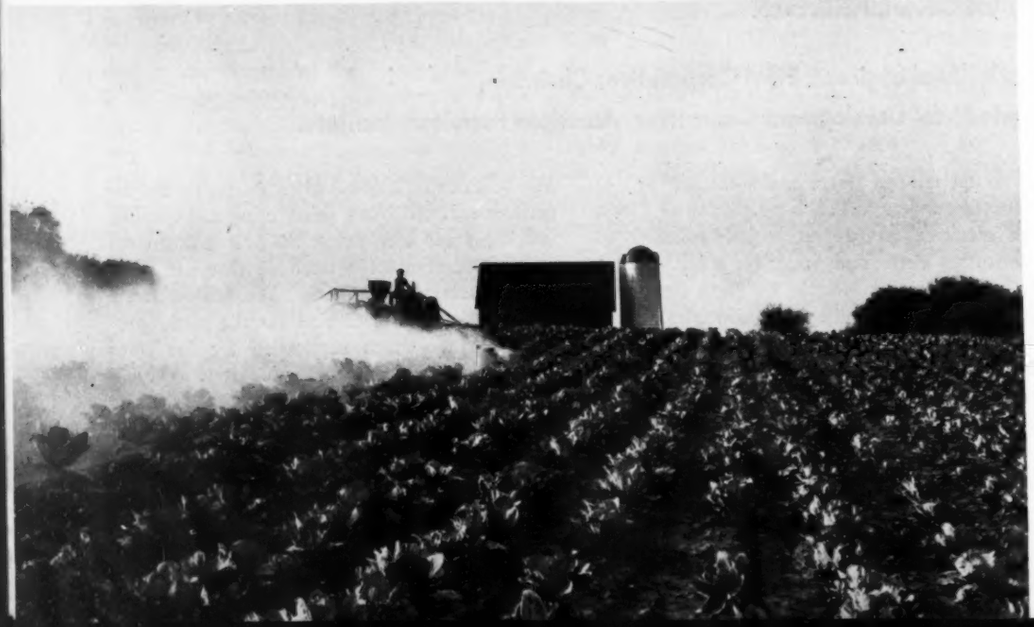
One potential market, as yet in its infancy, is the industrial utilization of farm products. As an industry that has pioneered in synthesis and hydrocarbon chemistry, it seems apparent that we can in time greatly increase the variety and quantity of farm products used by the petroleum industry.

Our Agricultural Development Committee has recently established a promising cooperative working arrangement with the Bureau of Agricultural and Industrial Chemistry of the United States Department of Agriculture. The proposed program is further approved by the Agricultural Research Administration of the U.S.D.A. Congressman Clifford Hope of Kansas, chairman of the House Agricultural Committee and co-author of the well known Hope-Flanagan Bill, has personally discussed the potentials of cooperative petroleum-agricultural research with the Board of Directors of the American Petroleum Institute. He stated that he feels the projected farm program of the petroleum industry is an excellent example both spirit-wise and letter-wise of the type of progressive research envisioned by the Congress.

We believe that scientific power farming, if it is going to succeed as its well wishers are convinced it can succeed, must be based on sound principles of economics, chemistry, and engineering. When we mention scientific power farming, we do not refer to "farm mechanization" as it is commonly understood. A large portion of "farm mechanization" to date has consisted primarily of substituting mechanical power for animal power. By scientific power farming we mean the actual application of the fundamental principles of economics, chemistry, and engineering, to farm practices in the same way they have been applied by general industry as a matter of routine for many years.

We believe that half-baked measures, partial experiments, temporizing, substituting and evading, will delay and even defeat the first real attempt at modernization of agriculture that has taken place in several generations. We believe that a tractor using too much fuel for the power produced, or too much lubrication for the acres covered, is a detriment to our industry. We believe that we owe to the pioneers in scientific power farming the same careful research, the





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Oil provides power for chopping corn and filling ensilage pit in New York State.

Below, Center—Combine saves time in harvesting grain.

same benefit of experience, the same quality of service, that we render automatically to any industry using our products.

Based upon this premise, we have organized our Agricultural Development Committee to chart a course of intelligent assistance to agriculture. We have asked experts outside the oil industry to become members of our Committee, with full voting powers and a free voice in its discussions. When the Committee starts a discussion involving insecticides we don't want to refer the question pending a paper on the subject by an entomologist. We want one there. We want him to shoot, and to be shot at, for the simple reason that from pro and con discussion, and only from that, can an intelligent approach to agricultural problems be reached.

In addition, we propose to set up a number of regional committees. The duties of these groups will be to investigate the agricultural problems of the areas in which they live and do business, and to act on their own initiative, on local problems.

If the lettuce growers of southern California, for instance, have a problem involving petroleum products, no Oklahoma cattleman, or Mississippi cotton planter, or the men supplying either of them with oil, can be of the slightest assistance in solving it. That will be a matter for lettuce growers and the oil men familiar with their problems to discuss.

Our Committee intends to consider problems of national significance, and to authorize research projects which they deem of national worth. They also will receive recommendations from regional committees and will consider research expenditures that the local committees deem beyond their financial abilities. Actually, in a great many of the instances we have investigated to date, the amount of money involved is not enough to scare anybody. It just takes some doing and somebody to do it.

Another channel of action upon which we are working is the formation of a technical advisory board, or panel. We are enlisting for that purpose outstanding authorities in the basic phases of agriculture, to serve as an unpaid advisory body to assist us in expending our efforts for the greatest benefit. We don't want to waste our time proving something that already has been proved, or that the nation's outstanding agricultural authorities have reasoned doesn't make any difference anyhow. That may seem moot in discussion, but we have learned already that a great deal of money is thrown away in research proving things that have been proved before.

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Dusting a cabbage field in Maryland.

Farm pump for fueling—survey shows 2,400,000 tractors on U. S. farms.

Another line of activity concerns close cooperation with other organizations, such as the insecticides and fungicide industry. The petroleum industry has become a leading supplier of the basic materials for insecticides, fungicides, synthetic plant hormones, herbicides and other similar materials. It is obvious, therefore, that our activities must be as closely allied as possible if the farmer is to reap the greatest benefit of the new discoveries, new processes, and new equipment now being developed in this important field.

The oil industry is producing, as a result of catalytic cracking of crude oil, a wide variety of toxic compounds, some of which have proved themselves to be destroyers of various insects, weeds, plant fungi and other enemies of the farm. Exactly what they can, and will do, we don't know and neither does anybody else.

We do know that not so many years ago the settlement of the great plains of the middle west actually hung in the balance as a result of insect pests and plant diseases. Grasshoppers, locusts, army worms, blight, rust and whatnot all but ruined the economy of frontier areas hundreds of miles in extent. Many a homesteader in Kansas, Nebraska, the Dakotas and adjacent states saw this year's work wiped out in a single afternoon and his hopes of owning his own farm go glimmering. Courage and will, he found, were no defense against the irresistible power of clouds of insects or the attacks of plant diseases.

We have come a long way since those days. We have found defenses against a number of the more destructive insects and the more virulent plant diseases. Insect and fungus destruction of foods no longer makes the headlines, and is all but forgotten in the public mind. Nevertheless, insects and plant diseases continue to struggle for life as they have since the dawn of the world.

These plagues are not conquered. The United States Bureau of Entomology and Plant Quarantine estimates that insects are destroying two billion dollars worth of farm crops annually and that plant diseases add a billion a year more to the debit side of the food ledger. Human warfare comes to an end eventually. Insects and plant blights never cease their war on the fruits of human toil. The three billion dollars a year of which we spoke goes on year in and year out, a loss that not all the labor in the world can overcome.

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Now, however, we may say—with a great deal of caution—that the farmer has what may prove to be the best new weapon as yet available for the war against these pests. If the new petroleum-based toxic compounds, and the new synthetic hormones, do the job everybody hopes they will do, then something constructive for the world has been accomplished.

It's far too early to say that they will. It's far too early to do any viewing with pride, or to make any predictions, as to the eradication of insects and plant destroyers, either to the farmer or even to ourselves. But at the very least we have some new weapons, some tools with which we may experiment toward a common goal.

We want to urge all industries serving agriculture, as well as the petroleum industry, to do two things in this regard. We want to make exhaustive and endless experiments, not only of the immediate effects of such new compounds as DDT and 2, 4-D, and the many variations of them, but also of the long-range effects. We want to be able to point out, not only the benefits, but also the defects, of these insecticides, fungicides, and weed destroyers. We want to be able to tell the farmer, "use it here, but don't use it there." We want to be able to tell the farmer how best to apply these compounds, to tell him whether to use a spray—and if so, what kind of a spray—or a dust, or fog, or a combination of both. Until we can advise him thus, and with a reasonable degree of confidence in what we are saying, we do agriculture a disservice in making any new products available. Above all, we would be far less than intelligent were we to make the farm a testing laboratory and the farmer's crops a guinea pig.

We are on the threshold of a new day in agriculture. We can see ahead a day undreamed of just a few short years ago. We can see the comprehensive scientific knowledge of our nation applied to the production of food. We can see that if and only if, we do our share in these early and formative days of scientific power farming agriculture can go forward or backward, depending to a large extent on how we, its suppliers, lend it the benefit of our accumulative knowledge in the next decade.

If we do our best, if the petroleum industry, and every other industry supplying the farmer, the agricultural colleges, the experiment stations and the U.S.D.A. research agencies, does its best; if the farm organizations take a fair and realistic view of this revolution in agricul-

There are more than four million small stationary motors on U. S. farms.

ture—then scientific power farming will be another of the great accomplishments of the United States, comparable to our progress in other fields of endeavor. Profits depend on skill, not price. American industry has demonstrated times without number, that volume production of low-cost merchandise commands the greatest market and enjoys the greatest profit. Skill gets that job done.

The major objectives of the A.P.I. Agricultural Development Committee are as follows:

(1) Continued and expanded research into products that combine those of the farm and the oil field, and new uses for them.

(2) Study of insecticides, fungicides, weed destroyers, fruit ripeners, liquid fertilizers, and similar petroleum products.

(3) Furtherance of soil conservation and fertility-maintenance programs, including the maintenance of optimum biologic relationships.

(4) Study of efficient and profitable farm mechanization.

(5) Study of all products in relation to their use on the farm, to the end that we provide maximum service at minimum cost to agriculture.

(6) Cooperation with all organizations devoted to agricultural progress.

Thus the Agricultural Development Committee of the American Petroleum Institute has the stimulating assignment of formulating and maintaining a long range, comprehensive program to correlate agricultural products with petroleum products. In the field of chemistry there are many ways in which petroleum chemicals can combine with agricultural derivatives to form new products and thus create new industries. Our committee will seek to ferret out these possibilities and to encourage, stimulate and accelerate their development. Activity of this type is not new to the petroleum industry. Many oil companies have well-developed programs in this field and others have been entering it in appreciable numbers. The principal function of our committee is to help correlate these endeavors and to provide a common forum for pooled experience.

Members of the Agricultural Development Committee are: George Krieger (chairman), in charge of farm research. Ethyl Corp., New York; G. G. Biggar, assistant manager, public relations department, Shell Oil Co., Inc., New York; Rush M. Blodget, Oil Producers Agency of California, Los Angeles, Calif., Dr. Oscar C. Bridgeman, manager, sales technical division, Phillips Petroleum Co., Bartlesville, Okla.; C. M. Byers, manager, farm sales, Standard Oil Co. of New Jersey, New York; W. J. Carthaus, general sales manager, Deep Rock Oil Corp., Chicago; Frank L. Copening, Jr., general sales manager, Idaho Refining Co., Pocatello, Idaho; N. B. Curtice, manager, northwestern marketing division, The Pure Oil Co., Minneapolis, Minn.; John C. Dean, manager, process products division, Socony-Vacuum Oil Co., Inc., New York; P. D. Denton, assistant to the vicepresident, Sinclair Refining Co., Chicago; Ross Floyd, director, agricultural service, Continental Oil Co., Ponca City, Okla.; R. P. Frey, supervisor, farm sales promotion, Imperial Oil Limited, Toronto, Canada; Lloyd H. Geil, field representative, public relations, Standard Oil Co. (Indiana), Chicago; Bernard E. Gray, general manager, The Asphalt Institute, New York; Fred W. Herlihy, Farm equipment Co., Orangeburg, South Carolina; Lea S. Hitchner, executive secretary, Agricultural Insecticide & Fungicide Assn., New York; K. G. Mackenzie, assistant to vice president, The Texas Co., New York; G. L. Mateer, technical director, Petroleum Advisers, Inc., New York; W. A. Matheson, manager, Williams Oil-O-Matic division, Eureka Williams Corp., Bloomington, Ill.; C. F. Ramey, assistant manager, product acceptance department, Standard Oil Co. of California, San Francisco; T. J. Sullivan, general manager, manufacturing department, Gulf Oil Corp., Pittsburgh, Pa.; Selwyn Turner, president, National Butane Co. of Alabama, Inc., Mobile, Ala.; J. Richard Verkamp, vice president, The Verkamp Corp., Cincinnati, Ohio; F. V. Wallace, assistant to the president, The Shamrock Oil & Gas Corp., Amarillo, Texas; J. D. Wooten, vice president, The Mid-South Oil Co., Memphis, Tenn.; Robert E. Allen (secretary), director, department of information, American Petroleum Institute, New York; Georgia Stiggleman, corresponding secretary, Agricultural Development Committee, American Petroleum Institute, Chicago. Permanent alternates are: Elwin E. Hadlick (for J. Richard Verkamp), executive vice president, National Butane-Propane Assn., Minneapolis, Minn.; E. A. Snyder (for John C. Dean), chief engineer, process products division, Socony-Vacuum Oil Co., Inc., New York.

Awarded Cadman Memorial Medal

The Cadman Memorial Medal for outstanding research in petroleum science has been awarded to Robert P. Russell, president of Standard Oil Development Company, the Institute of Petroleum, London, has announced. The medal is awarded at least once every three years for scientific contributions in the field of petroleum. Mr. Russell will receive that medal June 4 when he delivers the second Cadman Memorial Lecture in the lecture hall of the Royal Institution, London. He will speak on "Progress In Petroleum Research." The medal, first awarded in 1946 to Sir William Fraser, C.B.E., commemorates the great services of the late Lord Cadman.

RADAR PROVES USEFUL TOOL IN MARINE SURVEYING*

by W. H. Wilson
Humble Oil & Refining Company

CONSIDERABLE publicity has been given during the past year to the potential oil reserves in the continental waters of the United States. A great deal of this interest is centered on the waters of the Gulf of Mexico adjoining the coasts of Louisiana and Texas on the theory that the known producing horizons of these states will be encountered under the waters of the Gulf of Mexico. It is too early to say what the results of this offshore drilling program will be or how far from shore the search will extend. Most of the present activity is now centered in Louisiana where the State Mineral Board has subdivided the Gulf of Mexico water bottoms along the major portion of the coast line and has leased numerous tracts for oil development. Most of these subdivisions extend approximately thirty miles from shore where the depth of the water averages about 60 feet, although in some areas it may be as deep as 150 feet or more.

In considering the problem of oil development in this offshore area, it will be necessary to conduct geophysical explorations to determine the most likely place to drill. After the well location has been selected, it must be marked by a buoy or a pile, located a certain number of feet from the lease boundaries. If the well produces oil, additional construction may be necessary to treat or to transport the oil. All of this work requires surveying—surveying in a trackless waste of water.

It seems appropriate at this point to make an observation on marine work in general. When operations as familiar and as standardized as oil drilling and geophysical exploration are transferred from their natural habitat on dry land to an area 10, 20 or more miles offshore, where the land not only isn't dry but is 25, 50 or more feet straight down, such operations quickly cease to remain either familiar or standardized. All the usual engineers and experts in the fields of applied science must be called in on the problem, together with a few new ones such as oceanographers and meteorologists. Everything that is done takes more time to perform and is considerably more expensive. Marine surveying is no exception to this general rule.

Geophysical exploration in the Gulf of Mexico has been carried on in Louisiana coastal waters by several oil companies during the past year. The nature of this work demands that the position or location of a large number of points be determined rapidly. Speed is the essence of the work of the engineer engaged in surveying for a geophysical crew. If the crew has to wait while a line is laboriously measured or while a triangulation problem is executed, the lost time becomes alarmingly expensive. Along with the need for speed, a reasonable accuracy must also be attained. However, the accuracy requirements for most geophysical surveying are less severe than for well locations.

In contrast to the geophysical work, the drilling program in the Gulf of Mexico is still in its infancy. One well, located seven miles offshore, is now being drilled by the Magnolia Petroleum Company which has also begun work at another location about 27 miles offshore. Humble Oil & Refining Company has started operations at a location about seven miles offshore and will soon make another location about five miles from shore. Four other tentative well locations have been announced by other companies but work has not been started. The best information on these tentative locations indicates that the distance from shore will be about three miles, seven miles, 12 miles and 20 miles. In other words, including the Magnolia drilling well, only three well locations have actually been staked. While the surveying problem for well location is not yet acute, it is apparent that the acute stage may soon be reached.

With the foregoing in mind, let us take a look at some of the tools, both old and new, and some of the methods that may be used to solve the surveying problems of marine development. It will be well to maintain an open mind on this matter and give consideration to any new tool or technique that seems to fit the problem. It may also be timely to emphasize that this is not a chronicle of successful achievement of marine surveying, but rather it is an attempt to point out some of the elements of the problem and to discuss a few of the steps that have been taken to meet it. A year from now, or two years from now, a much better presentation of this subject can be made.

Triangulation from a known base line on shore is a well-established method for locating an offshore point. However, as operations are extended seaward, the practical and economic limits of visibility from shore are quickly reached. In this connection, it may be of interest to refresh our memory as to how fast the curvature of the earth and atmospheric refraction begin to affect the line of sight. Considering both these factors, the differences between an apparent level line and a true level line at a distance of one mile is about 0.6 of a foot; at a distance of five miles this has increased to 14.4 feet; at a distance of 10 miles the difference is 57.4 feet; at 20 miles it is about 230 feet; and at a distance of 30 miles the difference has increased to approximately 517 feet. This means that if an observer wishes to see a flag across 10 miles of water, he must elevate the flag more than 58 feet above the surface since at this height the top of the flag will, with average refraction, just be visible. Several more feet will have to be added to the height of the flag to overcome variations in refraction and to provide a good clear view. Of course, the height of the flag can be reduced by raising the observer above the surface level.

Triangulation was the method used to make the Humble Oil & Refining Company well location about seven miles offshore. Radar was first used to locate a buoy at the approximate well site. Triangulation stations of the U. S. Coast and Geodetic Survey were conveniently available on shore, and the buoy was cut in from two of these stations. It was found that the buoy was located a short distance from the intended location. A single pile was then driven at a new location and rechecked by triangulation from shore. The computations indicated that the pile was within a very few feet of the projected well location.

It is of course possible to extend a triangulation arc offshore for distances greater than 30 miles by following the usual land procedure. This would require erecting towers on shore at existing triangulation stations and building additional towers in the Gulf from which observations could be made. In this manner, a system of triangles and quadrilaterals could be carried seaward. Probably 12 to 15 miles would be the length of each "step" from shore. This method could be used to locate offshore wells, and it would give results that would meet all accuracy requirements. However, triangulation towers on shore cost money, and when erected in the Gulf of Mexico, they cost lots of money. Triangulation for geophysical exploration is much too slow and cumbersome for the reasons heretofore mentioned.

Perhaps the most promising new tool for the marine surveyor is radar. Everybody has heard a great deal about its military uses in the recent war; in fact many persons have had personal ex-

* From a talk delivered at a conference of General Land Office Men and Texas University and A. & M. Civil Engineers, College Station, Texas.

perience with the wide variety of military uses to which radar was adapted. The fact that makes radar of interest to the surveyor is that it can be used to measure both distances and angles. Radar waves are analogous to light waves and travel with the same speed; i.e., at 186,218 miles per second, or about 983 feet in a millionth of a second, usually called a microsecond. Like light waves, radar waves will be reflected from an object in their path and will bounce back to the point of origin. The principle used in measuring distance with radar is, therefore, fundamentally simple. Radar waves are transmitted or pulsed toward an object at regular intervals. These waves are reflected back from the object, picked up at the transmitting station, and the time required for a wave to make the round trip is measured. One half of this time interval multiplied by the speed of travel of the wave gives the distance to the object. The radar set is constructed so that this computation is made automatically and the distance to the object is read directly on a dial.

The angle between two reflecting objects can be measured by successively turning the radar beam on each object and reading the resulting angle or bearing. However, the radar set must be specifically designed for this purpose in order to read angles with a sufficient degree of accuracy to be of value as a survey instrument. Only one type radar is available that can measure angles with an accuracy approaching survey requirements. This is a military unit, called SCR-784, which was designed to control the fire of anti-aircraft batteries. An SCR-784 unit can measure angles with a probable error of one mil. A mil is the angle subtended by a yard at a distance of 1000 yards, and amounts to 3.5 minutes. An SCR-784 unit was used for geophysical surveying and it worked fairly well as long as the distance from shore did not exceed eight to ten miles. One serious disadvantage was the large size and unwieldiness of the unit, which was mounted on a trailer and weighed around 25,000 pounds. Anyone familiar with the Louisiana coast line can realize the difficulty encountered in moving this equipment. Other disadvantages of this land based unit were the need for radio communication from ship to shore and the need for a separate crew with the attendant supply problems.

With one exception which will be discussed later, the radar equipment now available is military equipment designed to meet a particular need of the Army or Navy. Certain of these instruments can measure distance or range with a probable error of $\pm$ 20 yards. This error is a constant error and is independent of the distance measured. An error of 20 yards in measuring a line 10 miles long would have a magnitude of one part in 880. It is claimed that some radar equipment now in use has a range error of only $\pm$ five yards or a magniture of error of one part in 3520 in a line 10 miles long. Doubtless this accuracy can be attained under favorable conditions, but it is not certain that it can be obtained at all times.

The figures given as to the degree of accuracy of distance and angle represent what is obtainable with present equipment. This is not by any means the ultimate limit of accuracy of radar in either of these respects. To my knowledge, no radar equipment has been designed, to date, for the primary purpose of surveying. It is reasonable to expect that when this is done, the accuracy of range and angle measurement will be greatly increased.

Darkness, fog or rain do not prevent the use of radar, but radar does have its limitations. Radar waves travel a straight path from the transmitter to the reflecting object in a manner similar to light waves. An intervening hill, forest or the hump due to the earth's curvature will obstruct the radar wave. Therefore, in marine surveying, the length of a single radar "shot" is controlled by the earth's curvature and refraction, which is the same thing as saying the antenna and target must be elevated. Other factors that affect signal intensity are the distance the radar wave must travel and the size of the radar target. The intensity of light varies with the square of the distance, while the intensity of a radar signal varies as the fourth power of the distance. It follows that for a given distance a large target reflects a stronger signal than a small target.

When a position to be determined lies too far offshore for the radar to pick up shore targets, two or more intermediate targets can be set, and a system of triangulation carried out the desired distance. There is this difference in triangulation by radar and triangulation by ordinary land methods. Radar is used to measure the lengths of side of each triangle instead of measuring angles. In marine work this has the considerable advantage of not requiring stable towers or platforms to be constructed in the sea. Existing channel buoys or lighthouses can be used as intermediate points, or if these are not available, temporary buoys supporting radar targets may be anchored for as long as needed.

This is one of the methods now in use for geophysical surveying. A Mariner's Pathfinder is the radar equipment used. This equipment has been on the market for about eight or nine months and apparently, it has the distinction of being the first postwar radar to appear on the civilian market. Designed as a navigational aid for all types of shipping, it was necessary to modify the equipment after purchase in order to increase its range accuracy to a $\pm$ 20 yard error. It should be noted that this instrument is primarily designed to measure distance and its angle or bearing accuracy is only $\pm 2°$. The Mariner's Pathfinder unit is installed on the surveyor's boat. Position determinations are made by measuring the distance to two or more targets on shore. Oil derricks make excellent radar targets, but if these are not available, lighthouses, beacons or buoys may be used. This method results in a very flexible operation and eliminates the need for any communication since the radar instrument is located on the boat whose position is desired.

The same equipment is employed in a slightly different manner by using a target boat which is equipped with a radar target, the center line of which is elevated about 300 feet above water. This radar target consists of two vertical, diamond-shaped planes made of metal mesh arranged at right angles to each other, with a third horizontal plane of similar shape and construction bisecting the two vertical planes. The engineer boat anchors a buoy or a balloon at one end of the line to be measured and determines its position by measuring the distance between two or more known objects. The target boat is left standing alongside this marker while the engineer boat runs the line. As the engineer boat proceeds on line, its distance from the target boat is constantly available on the radar dial, and at desired intervals on the course, temporary balloons or buoys are thrown overboard to mark points for instrument stations. The engineer boat continues on this course for several miles and sets a temporary buoy at the end of the line. The target boat then proceeds to the end of the first course and the same procedure is repeated on a new course. In this manner a closed traverse can be run, having three, four or more sides, and the fix or position of each corner of the traverse can be determined by the engineering boat from known points. The ultimate range limit of the target boat depends upon the size of the target and the height of the transmitter and target above the water. The effective range of the present equipment is about 10 miles.

Another type of radar equipment, called Shoran, can also be used to measure range or distance. Unlike the Mariner's Pathfinder equipment, which reflects radar waves from the target, Shoran re-transmits a radar signal back to the master station. The master station transmits pulses alternately on different frequencies. These pulse groups are received at two slave stations, sometimes called "transponders" or "beacons," which re-transmit the received signal back to the master station on a third frequency. The distance from the master station to each of the slave stations is read directly from dials which can be calibrated in feet. Since the positions of the two slave stations are known, the fix of the master station on the surveyor's boat is at the intersection of the two arcs swung around the two slave stations. The error in measuring distance with Shoran is about the same as for other types of radar equipment. A safe estimate of error $\pm$ 20 yards, independent of distance measured, although claims to greater accuracy have been made.

This type of radar is now being used for geophysical exploration and is giving satisfactory results. One disadvantage of this equipment and method lies in the fact that all the equipment is not centrally located, which causes greater difficulty in making repairs or minor adjustments. It also requires more personnel to operate.

During the past year the 311th Reconnaissance Wing, U. S. Army Air Forces, cooperating with the U. S. Coast and Geodetic Survey, conducted experiments in the use of Shoran to measure distances up to 500 or 600 miles with geodetic accuracy. While essentially the same equipment was used as has just been described, it was necessary to use a different method of obtaining this great range. Briefly, this consisted of placing the master station in an airplane which flew a straight course normal to the line to be measured and at its approximate midpoint. The plane was also required to fly at a constant and carefully measured attitude. A slave station was placed at each end of the line to be measured. The radar dials of the master station in the plane would indicate the slant distance from the plane to each slave station at all times. As the plane approached a point directly above the line, the distance to each slave station would decrease until a minimum was reached at the instant the plane crossed the line, after which the distances would gradually increase again. A motion picture camera was used to photograph the radar dials. These readings were plotted as a parabolic curve and the minimum point used as the slant distance to the two slave stations. This procedure was repeated several times, and the average of the different flights used to obtain greater accuracy. With the altitude of the plane known, it was possible to reduce the slant distance to a geodetic distance. The results obtained by this method are very interesting and indicate that surprising accuracy can be obtained with additional improvements in instruments and techniques. A comparison of the observed distance computed from Shoran with the true distance computed by first-order triangulation methods indicates that lines varying from 148 miles to 308 miles in length were measured with a proportional error varying from one part in 8200 to one part in 60,000, with the average somewhere around one part in 25,000. While this method is expensive and requires a mathematical treatment of the highest order, it may be useful in marine surveying whenever it becomes necessary to determine the precise location of points 50 or 100 miles offshore.

A true picture of geophysical surveying in marine operations requires mention of some other instruments which are now being used to locate supplementary points which do not require the accuracy of control points. The sextant, the wire line, and the various types of compasses, including the magnetic, gyro and gyro-magnetic, are some of the instruments used. The most important of these are the sextant and wire line.

The sextant is a very simple and useful instrument for measuring horizontal and vertical angles. It can be used as a check on other instruments, in locating secondary buoys and markers, and in determining the meridian by solar observation. In making a sextant position fix, three or more targets are used whose positions are known. For three targets, the two horizontal angles between targets are measured and the position on the map is then determined by means of a three-legged protractor on which the two observed angles have been set. It is always desirable to select targets which will give sizable angles. On average days, fixes on shore targets of 25 feet or more in height can be easily seen at a distance of four or five miles. Longer distances can be used with higher targets and good visibility. Usually targets will consist of lighthouses, channel markers, oil derricks or buoys.

The wire line has been satisfactorily used to measure distances. In this method a fine piano wire, 0.029 inches in diameter, is fastened to an anchor on the bottom of the sea and passed over the stern of the boat which proceeds on a straight course along the line to be measured. A constant tension is maintained on the wire by a hydraulic control mechanism, and distances are read on a measuring sheave which is calibrated in feet. It is desirable to set a line of buoys in advance and record the wire line measurement as the boat passes each buoy, although buoys can be thrown overboard at predetermined intervals. A run of several hundred feet is made before the first buoy is passed so the line will come off approximately tangent to the ocean floor at a point back to the boat as each buoy is passed. The capacity of the reel is 12 miles of wire. At the end of the measured line the boat is turned back and the wire is picked up over a set of roller guides. The wire can be paid out and taken in at speeds up to about 800 feet per minute or about nine mph. It is expected that in the future the main function of the wire line method will be to locate secondary buoys and targets and as a standby for radar. The equipment is simple, has performed well, and a line three miles long can be quickly measured with a probably accuracy of $\pm$ 60 yards.

Compasses are primarily aids to navigation. However, they can be used for surveying supplementary points. Under good conditions, a true bearing can be measured with an accuracy of about two degrees with a bearing repeater from a gyro-magnetic compass, and with an accuracy of about 0.5° with a bearing repeater from a gyro-compass.

In conclusion, we are now probably in the "horse and buggy" days of marine surveying. It is to be expected, therefore, that as experience is gained in this type of work, instruments and techniques will be greatly improved.

To Install Radar

Standard Oil Co. of California plans to install radar as standard equipment in all its sea-going vessels following satisfactory tests on the SS. R. G. Follis. This Standard vessel was launched in October as the first postwar tanker built in the United States with radar embodied in its original design. In all, thirteen other ships will be radar equipped during their regular overhaul periods. Already the SS. J. H. McEachern and the M.S. Alaska Standard have been refitted.

To Enlarge Casper Refinery

Catalytic Construction Co. has received a $3,500,000 contract for modernization and expansion of the Socony-Vacuum Oil Co., Inc. refinery at Casper, Wyo. The contract involves a 4,000-barrel Houdry TCC unit, feed-preparation system, gas plant, gas-purification unit, catalytic polymerization unit and extensive alterations to existing equipment. Work in the field is expected to start in August.

Jarecki Promotions

W. Howard Pape, vice president in charge of Jarecki Manufacturing Company's supply division, announces the following personnel changes:

N. D. Marko has been named Panhandle district manager of the supply division of Jarecki Manufacturing Co. His headquarters will be at Borger, Texas, where he was store manager. He is succeeded by Fred Niemeier. Marko's long experience with the Jarecki organization dates back to the early days of the Seminole Boom.

J. D. Freeman, formerly store manager at Russell, Kan., has been promoted to district manager with headquarters at Great Bend, Kansas. J. W. Stewart has been promoted from field salesman to store manager at Russell. Hugh A. Brightwell and Jack Barnes have been added to the sales staff at Tulsa.

Opens Atlanta Office

Ladish Co., Cudahy, Wisconsin, has opened a new district office in Atlanta and discontinued its New Orleans office. The new office will be located at 452 Spring St., N.W. and will serve the southeastern territory. W. W. Bowie, formerly manager of the New Orleans office, has been appointed manager to direct the sale of the complete line of Ladish controlled quality seamless welding fittings, Ladish forged steel fittings and Ladish forged steel flanges in this territory.

Reacquires Tanker

The former tanker "Mobilube," survivor of a torpedoing and several air assaults in oriental waters, has been reacquired by the Socony-Vacuum Oil Co., Inc., from the U. S. Navy and will resume its place in the company's marine transportation fleet next fall after repairs and reconditioning. The ship was declared surplus by the Navy and sold for $555,000.

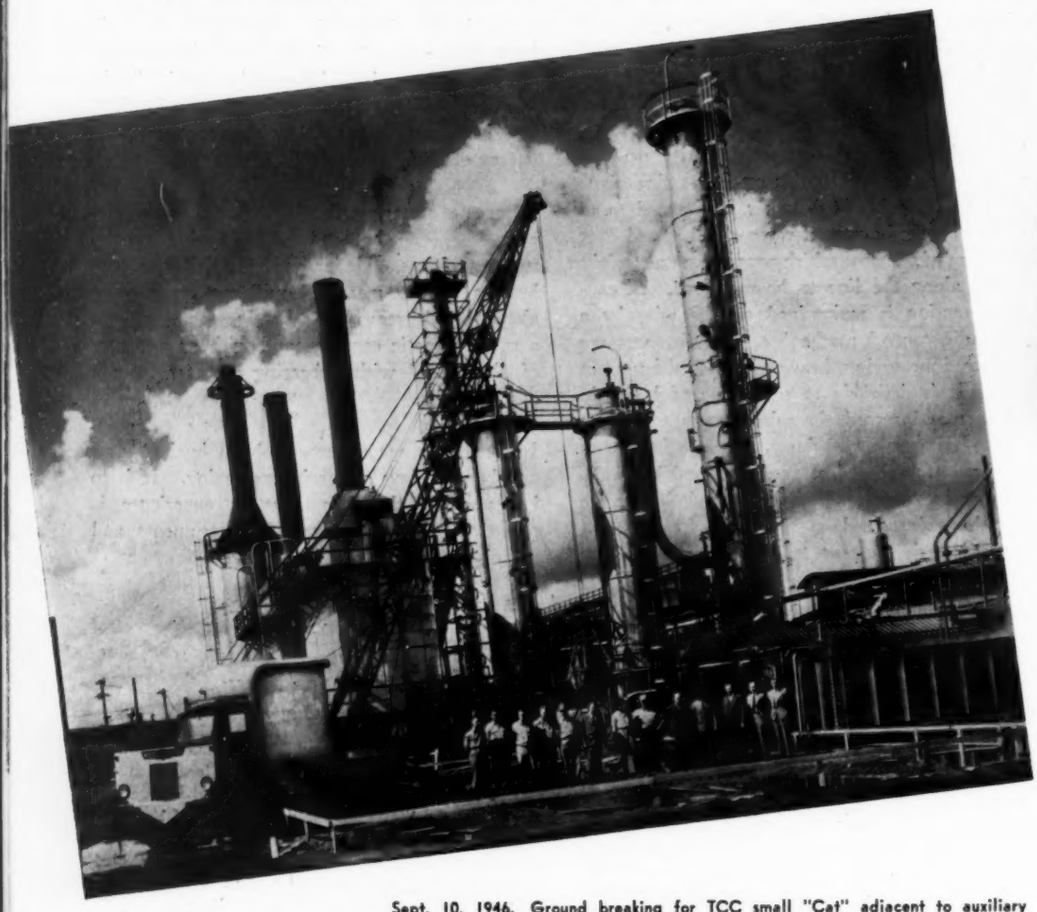
To Visit European Fields

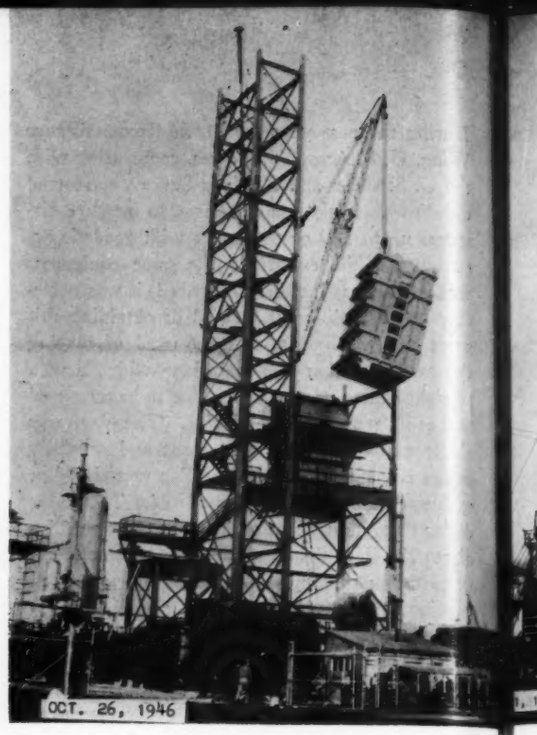
Jack W. Askins, who joined the New York office of the American Iron & Machine Works Co. last October after 56 months' service in the armed forces, is making a month's tour of the Mid-Continent oil fields studying equipment developments. After he returns to New York, he plans an extended tour of European oil fields.

Appointed General Manager

W. E. Curran has been named general manager of Rheem Manufacturing Co., it was announced by R. S. Rheem, president. He is also a vice president and director. Joining Rheem in 1942, Mr. Curran was made vice president in charge of production in 1943, and in February of 1946 was elected a director. He will continue to make his headquarters in New York.

FIRST TCC SMALL CATALYTIC UNIT





Sept. 10, 1946. Ground breaking for TCC small "Cat" adjacent to auxiliary furnaces and towers to be used.

BUILDING the country's first postwar small-scale catalytic cracking plant at Alma, Michgan, involved construction hazards that included almost constant high winds, near zero temperatures and the tightest materials' market on record.

The 3,000-barrel plant, erected for Leonard Refineries, Inc., by Catalytic Construction Company, subsidiary of Houdry Process Corporation, is the first small-scale thermofor catalytic cracking unit to be completed since the war utilizing the design developed to make this process available to refineries of lower capacity than the plants erected during the war period to supply high octane gasoline for military use.

Contract was awarded to Catalytic Construction Company April 1, 1946; ground was broken September 10; and the TCC unit was completed in less than five months. Additional work to revamp existing refinery equipment to tie in with the new TCC unit was done by the same contractor, and the entire job was finished in less than six months.

T. Ellwood Webster, president of Catalytic Construction Company and vice president of Houdry Process Corporation, attributed the speed of construction largely to the company's purchasing and expediting departments. Despite the limited availability of materials and equipment close coordination between these departments made possible the delivery of steel, fabricated pipe, reactor, kiln and elevator in record time. The following is part of Catalytic's delivery schedule:

Material	*Order Placed*	*Final Delivery*
Structural Steel	May 2, 1946	October 4, 1946
Reactor	April 2, 1946	August 30, 1946
Kiln	April 12, 1946	October 22, 1946
Fabricated Pipe	June 25, 1946	November 1, 1946

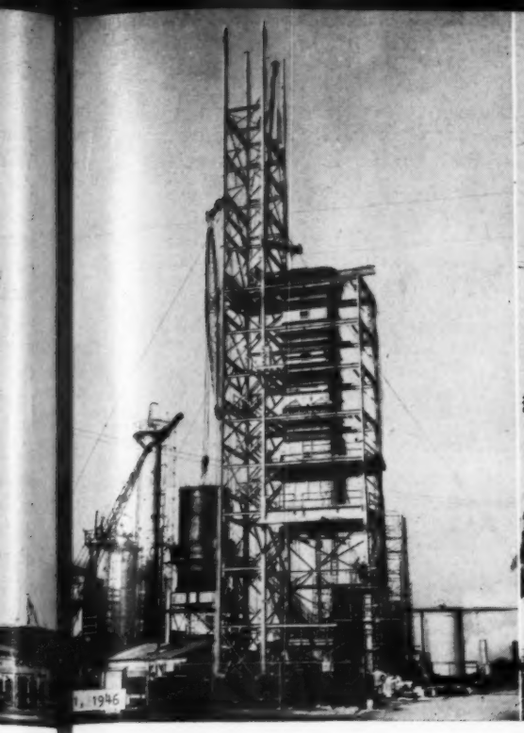
Because of the severe weather conditions encountered at the job site, several uncommon construction practices were adopted. Also the proximity of other operating units of the Leonard refinery restricted the available working space. Consequently, lifts of steel and equipment were made in as large sections as possible to cut down on the number of necessary tie-ins in the air.

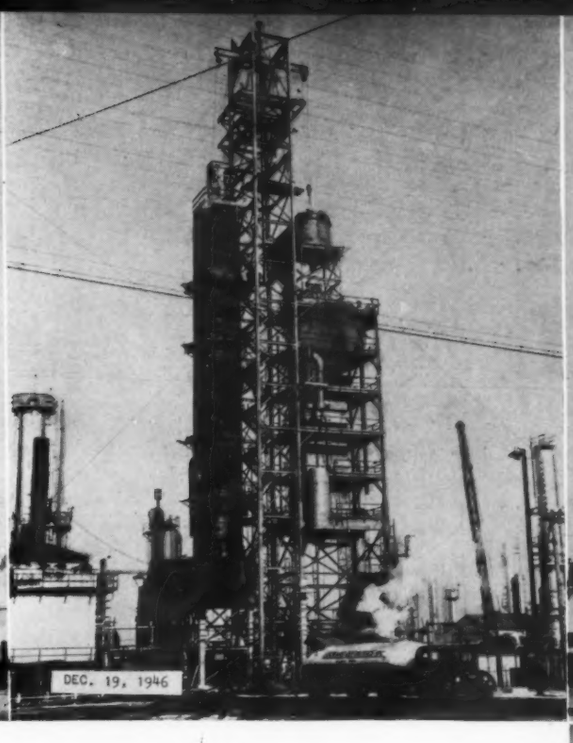
All steel above the main deck was raised with a six-inch pipe pole 80 feet high. A Chicago boom was bolted to the main columns to raise the reactor and kiln. The kiln was placed in 18-ton sections, and it was necessary to jump the boom only three times during this operation. The boom was then moved 90° and the same method was used for placing the reactor. This type of rigging results in maximum efficiency in time and use of equipment, and was well adapted to the limitations of the work site.

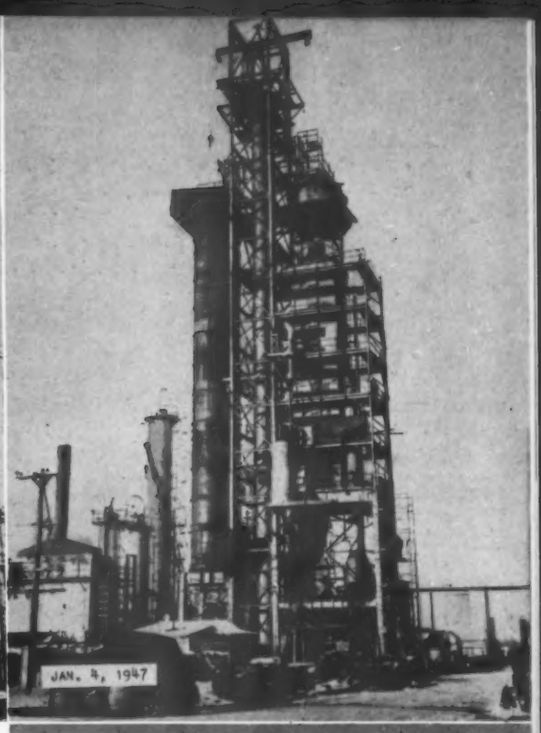
The insulation of the unit was installed at a time when the weather was most severe. It was necessary to heat the interior of the kiln in order to insure satisfactory work. The exterior of the reactor, however, being entirely exposed to the cold and high winds, presented a difficult problem. A "U" shaped stage was constructed with complete enclosure of the working areas, and insulation of the reactor was started at the top. The stage was lowered from the boom by cables as the insulating work progressed.

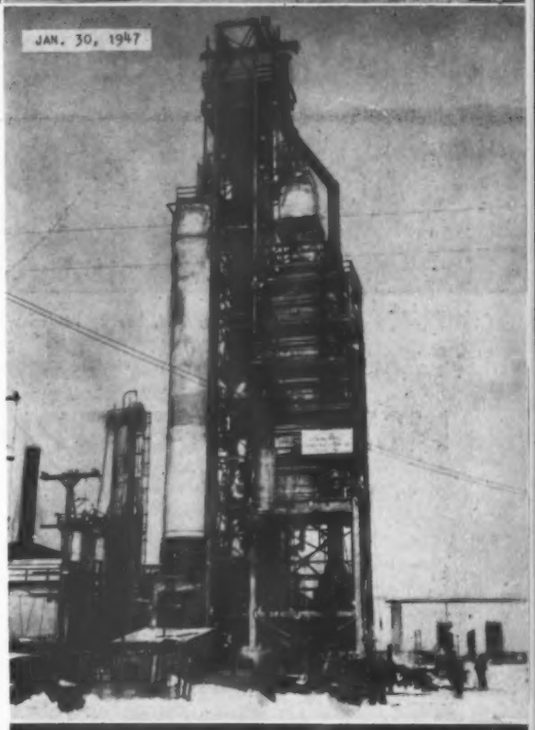
In addition to the erection of the TCC unit, the work involved revamping existing facilities to tie in with the new unit construction. This included the removal of tubes from stills, dismantling and renewing trays in the crude tower, removing old foundations and hot oil pumps, together with installation of new compressors and a complete new water system.

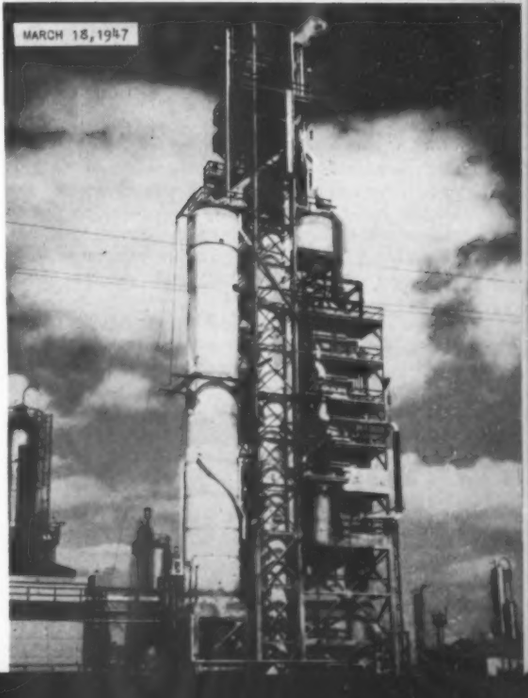
Two foundations which were removed from the pumphouse were approximately thirty yards each in length. The foundations were shattered by careful use of explosives while other equipment in the pumphouse was still in operation. It is estimated that the removal of the foundations











by blasting, which required a high degree of skill, resulted in a 95 percent saving as compared with the cost of their removal with pneumatic tools.

All of the pipe work for the revamp job was fabricated on the work site. In this work also it was found advantageous to fabricate the largest possible sections in the shop in order to limit the amount of erection work outside.

The average number of men on the job was approximately one hundred. Excellent labor relations were maintained throughout the construction period and no walkout or serious disputes occurred during the job in face of the complications which arose after the dissolution of the Wage Adjustment Board on November 9, 1946.

Matters on which jurisdictional disputes might have developed were handled through weekly meetings of the field superintendent with craft foremen. The high degree of mechanical skill and the cooperation shown by the entire crew have resulted in Catalytic engineers estimating that a similar TCC unit, erected under favorable weather conditions, could be completed in four months in the field.

The accompanying group of photographs taken during the course of construction of the unit are reproduced as a fragmentary diary of the construction job and show in some detail the units which go to make up a small catalytic plant.

Sept. 10, 1946. Ground was broken for the unit at a site selected because of its immediate proximity to the stills and fractionating columns of an existing thermal cracking unit which were to be used for heating feed stock and fractionating cracked products of the new catalytic unit.

Oct. 26. A boom capable of lifting 30-ton units was attached to the steel structure for lifting heavy sections of the kiln and, at a later date, the reactor. Space was limited at the site because of adjacent structures, making this tvpe of rigging attractive. It also saved time. The Chicago boom raised the kiln in 13 to 18-ton sections from three positions on the main column. Sections were welded into a continuous column after alignment.

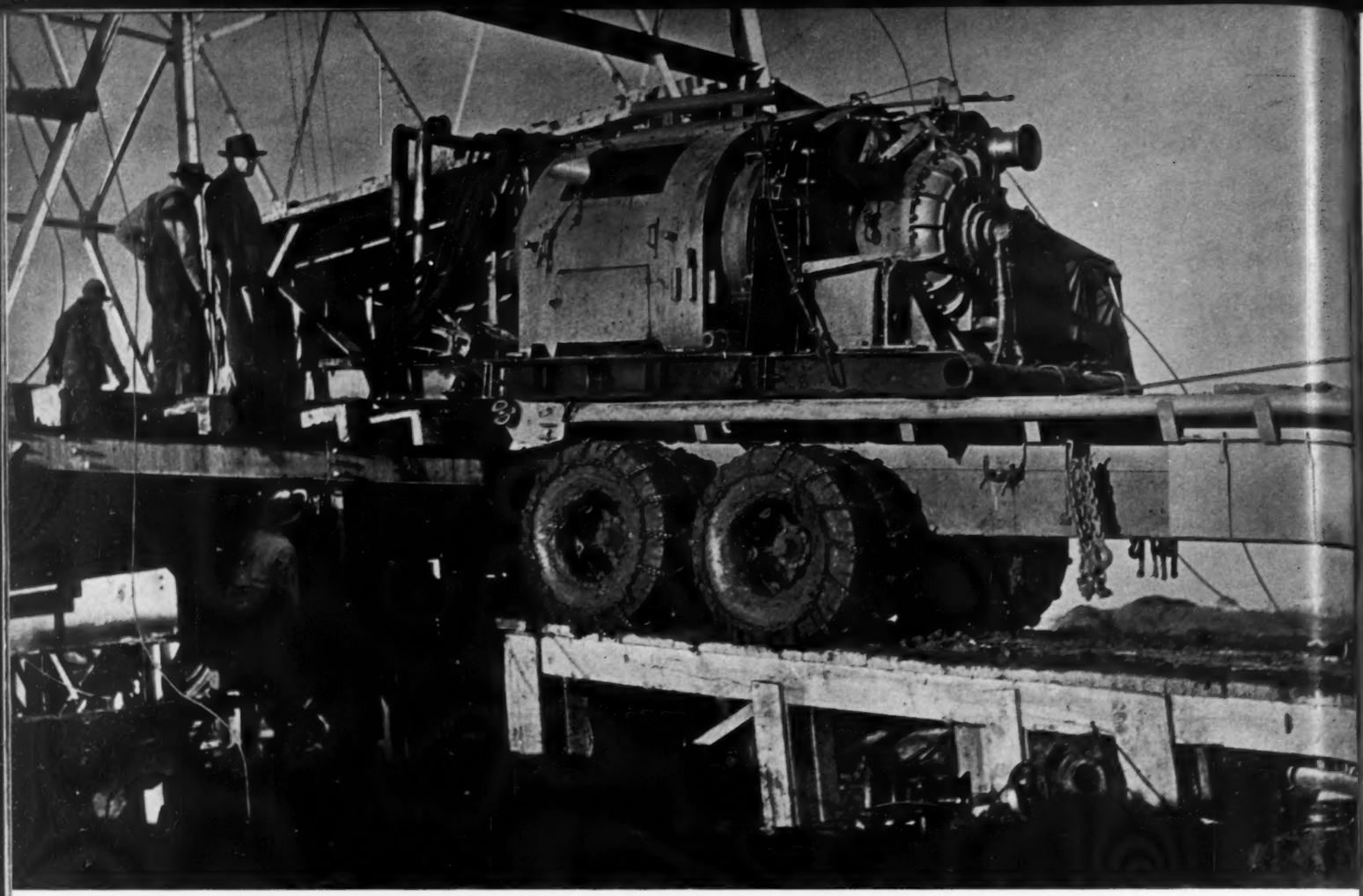
November 21. Kiln is in place and second section of the reactor is being aligned preparatory to making field girth weld. This section was 12 feet in diameter by 14 feet and weighed about 15 tons. Electrical conduits have been begun and junction boxes are being installed.

Dec. 19. Catalyst hopper is being installed above the kiln. Catalyst storage bin, elutriator and cyclone have been installed. Erection of piping has begun. Air duct from the air heater to the kiln has been started. Tarpaulin covered frame at base of the reactor has been installed to protect workers insulating the column.

Jan. 4, 1947. Elevator casing has been installed and other sections of the catalyst elevator are at the site ready for installation. Cooling coils in kiln are completed and air duct in progress.

Jan. 30, 1947. Except for necessary clean-up work, the unit has been completed in spite of severe zero weather and high winds. In the meantime, revamping work on the existing equipment is under way. This includes removing tubes from stills, renewing trays in the crude tower, removing old foundations and hot oil pumps, installing new compressors and a complete new water system.

March 18, 1947. On stream. As this is written, the unit has completed its first month of smooth operation. Starting up was accompanied by no difficulties according to the builders.



A single skid, heavily loaded with the entire unitized boiler feed assembly, is winched on truck as crew members supervise operation.

NEW DEVELOPMENTS IN PRODUCING EQUIPMENT

by F. A. STREET*

THE Jet Propulsion, Rocket, Atomic Age is now upon us. However, the oil industry is still mainly propelled by the standby since "Old Dobbin" became a luxury, namely, the internal combustion engine. The engine is still one of the large consumers of the world's petroleum products, but, nevertheless, has undergone a few changes. So has the allied equipment we normally consider as being a part of the engine. One of the major developments is the manner in which two or more engines can be compounded. Instead of a half acre of clutches, shafts, sheaves and belts or chains, we now find all our power coming out of one shaft through one clutch with a much greater saving in lost horsepower and much more economical operation, to say nothing of the decrease in moving time when used on portable equipment. We also find engines with a very wide range of horsepower using the same basic spare parts. One manufacturer has four, six and eight-cycle engines using the same pistons, rods, inserts, etc. The only parts not interchangeable are the crankshaft, camshaft and a few miscellaneous items not replaced frequently.

The trend in the drilling business remains the same; that is, deeper wells in less time with more portable equipment. To emphasize, in 1946 we find them skidding the tallest derrick in the world and setting a string of seven-inch casing to a depth greater than 16,000 feet. Either feat would have seemed like a Paul Bunyan tale only a few years ago. We also find rigs being moved in a few orderly truck loads, each load consisting of a "section" made up of allied equipment that need not be dismantled. This not only saves time and moving costs, but indirectly saves maintenance costs and gives more satisfactory service by making the rigs more uniform and using "factory" parts. The days of each driller adding his own gadget that must be constructed by a local machine shop are gone. The modern rig can be moved and making hole before the household can move across town and back to balanced diet.

Rig designs to reduce moving and rigging up time have shown some interesting ideas. Some of these are incorporation of water tanks into engine substructures, prefabricated engine house flooring hinged to substructures, double-decked tool houses with one house on the ground and the second even with the derrick floor, and prefabricated pipe racks of several types. Improved rig design pays out rapidly in faster, more convenient rigging up; in reduced trucking charges on moves; and in more efficient operation while drilling.

As a tribute to the manufacturers of oil drilling equipment, a well-qualified oil company engineer recently stated that drilling costs per foot of hole decreased in 1946 despite higher labor costs and higher unit costs for every item of equipment. The answer is that the equipment was so much better that it cut costs, contrary to the general trend.

In drill pipe we find more operators using shrink type tool joints or integral joint drill pipe. In the shrink type tool joint, they find the advantage of being able to install new joints on location is a time and money-saving principle. In the integral joint type drill pipe, they find the elimination of the tool joint a big asset. Instead of putting on new joints, the upset which corresponds to the tool joint surface is simply and economically built up by welding. It is unnecessary to shut down

* *Export representative, Jones & Laughlin Supply Company.*

or slow down regular operations, as a good welder can build up joints faster than the crew can normally make hole. The I.J. type also reduces the number of wash outs due to the streamlined interior, thereby cutting down on twist-offs and fishing jobs. There are also two manufacturers making drill pipe with specifications much higher than API Grade E. In fact, we predict either a new API grade drill pipe or new specifications for present grades to meet the rigid demands of deeper drilling.

The drilling industry also owes a vote of thanks to the bit manufacturers who are continually experimenting and improving their product to keep up with and ahead of the deeper, faster, more economical trend.

1946 brought a wider use of alloys, aluminum, magnesium and plastics. We find them used in various parts of most all drilling and production items. One manufacturer has brought out an aluminum reciprocating pump, and we find a new aluminum spudder for seismograph work being manufactured. Whether this trend will invade the larger items remains to be seen, but more fantastic things have happened in the oil industry. In our export sales we have already had numerous requests for Christmas trees, shale shakers, coring reels and other items to be crated to specifications which allow shipment by airplane. So don't be surprised to see some of the larger items employing these lighter metals and plastics in conjunction with stronger alloy steels.

An entirely new tool to aid in the drilling of directional wells was introduced to the industry and tried successfully last year. The new device prevents drill pipe from becoming stuck in key seats when pipe is being pulled. It consists of a steel sleeve mounted so that it can slide on a splined mandrel placed between the drill pipe and the drill collar. When drilling is in progress, the sleeve rotates with the drillstem. When pipe is being pulled, the fact that the sleeve is larger than the drill collar tends to wipe out or stick in key seats. When sticking occurs, the drill string may be lowered about two feet without moving the sleeve. If the drill string can then be rotated freely, it is proven that the sleeve is stuck and the tool may be worked up through the key seat by pulling up and rotating or by alternately dropping weight on the sleeve and pulling up against it.

Each year the oil industry is offered more tools for determining sub-surface conditions in its wells. One of the latest developments is an improved camera which may be used to photograph the well bore either continuously, inch by inch, or at stated intervals. A modified movie camera with a water chamber to supply a cleaned fluid in front of the lens has been designed which can be electrically controlled from the surface. For the future it may be noted that one company is working on a wired television unit which will send visuals to the surface. Such a device as this should be most helpful in fishing jobs and surveying corrosion of casing strings, as well as studying well walls.

Another new device for obtaining more sub-surface information is a gas meter which can be lowered in the borehole to determine exactly where gas is being produced and in what quantities. The meter is especially useful in multi-zone gas fields where its use has brought surprising results to some companies which have made studies with it.

Another production rate tester is a spinner which may be lowered in the borehole on a two-conductor cable to record the rate of flow of liquids at various points opposite the formation or in casing. This device has been helpful in locating holes in casing and measuring the inflow of water from such holes.

Radioactive markers have been offered the industry to give the petroleum engineer accurate sub-surface markers which can be returned to at any time in the future for recompletions, remedial work even after surface equipment has been changed, or for accurate placement of cement squeeze jobs. The markers are tiny brass capsules of radium salts which are set in the walls of boreholes by gun perforator methods. Subsequently the exact location can be determined by gamma ray emanations for as long as 1500 years and through two feet of cement and steel.

During the past year a bottom hole pump, described as pump in and pump out, has been announced. The pump is placed in its working position by pumping down the tubing and can be returned to the surface by reversing the flow back through the tubing. The particular advantage in this device is that the bottom hole working mechanism can be removed by pumping out rather than by pulling and rerunning tubing.

Long stroke hydraulic jack pumping units are being developed, particularly for deep well pumping. These particular units have strokes as long as 20 feet and operate six to eight strokes a minute. The particular advantage is that a lower peak load and consequently a smaller stress is placed on the rod string as compared with the stress placed in the rod string by conventional type of beam pumping unit. With deeper production in Southern Oklahoma and West Texas, it is possible that this type of hydraulic lift may have an application.

There has been considerable use of paraffin scrapers in the West Texas and the Pampa, Texas, areas. These scrapers are attached to the rod string, and are placed sufficiently close together so that the areas over which they work slightly overlap in the tubing. Some of them are welded to the rod string and others are put on by means of clamping.

In the Hugoton gas field, particularly in southern Kansas, some trouble is being experienced by reason of acid by-passing outside the casing from one zone to another when these various zones are being selectively and separately acidized. A new type of rotary scratcher has been put on the market recently to help prevent this. These scratchers are vertical strips with spring type fingers, the strips being welded on the pipe 120 degrees apart, and after the casing has been run to the desired depth, the entire string of casing is rotated prior to and during the cementing process, in order to clean the mud cake from the face of the formation.

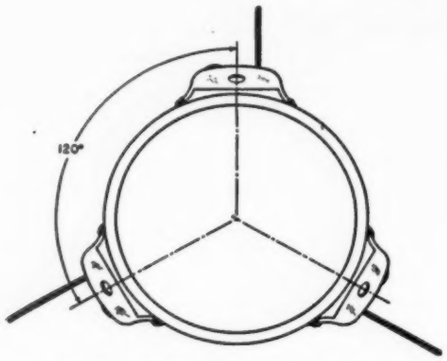
Among the laboratory devices designed to aid the petroleum engineer in well location and rate of production in cycling or water flooding is a new type instrument developed to facilitate potentiometric model studies. Two models of the new device have been made, one of which is in California and the other in Texas. The "Chronocartograph" as it has been named vastly reduces the time required for complex field model studies. Work of hours or days has been reduced to a matter of minutes.

Another time saver is the pool analyzer developed in research laboratories of the Carter Oil Co. at Tulsa and offered to the industry last year on a royalty-free basis. This electronic device is able to solve within the space of a few minutes problems involving the best methods of producing an oil field over a period of 25 years or more. The computations necessary to solve similar problems by ordinary means would require years.

Boilers are moved, one to a truck, with steam and water headers, stacks and gas burners left intact. Often the move is made with such dispatch that water in the boilers is still warm when they are unloaded and hooked up again to begin operation at the new location. All photographs with this article courtesy Humble Oil & Refining Co.

Howco Roto-Wall Cleaner

THE Howco roto-wall cleaner was developed by the Halliburton Oil Well Cementing Co. for the purpose of removing the filter cake from the wall of the hole through the section to be cemented, and for centralizing the casing in the well bore prior to the cementing job. As a result of research it was learned that the upward movement of the cement slurry during the cementing operations does not always remove the filter cake from the wall of the hole. The mechanical removed of this residual filter cake and the centralizing of the casing in the hole is of material aid in obtaining good distribution of cement behind the casing, a cement bond with the wall of the hole and reduction of channeling.



Section of Halliburton Roto wall cleaner.

The cleaning of the hole with roto-wall cleaners is accomplished by spring steel spikes fastened to the cleaner body through a triple coil (see diagram). These spikes are not subject to bending or breaking during rotation in either direction or upward or downward movement of the casing. The cleaner body is tack welded to the casing. The casing is rotated at the surface using either a Howco casing swivel or a Howco swivel head.

Each section of Howco roto-wall cleaner is five feet in length, contains 44 spikes and effectively cleans a hole five inches larger than the O.D. of the casing. Only one size of roto-wall cleaner is required for all casing sizes. The number of sections required depends on the thickness of section to be cleaned, which is ordinarily the thickness of the productive section plus several feet above and below that section.

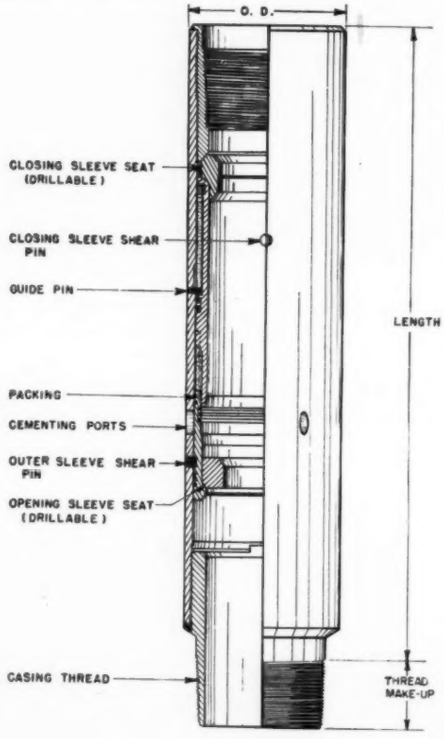
Multiple Stage Cementer

THE D. V. multiple stage cementer was developed by Halliburton Oil Well Cementing Co. for use in obtaining better primary cementing jobs. It is a precision tool designed and built to assure the operator safe application on any well regardless of depth, pressure or temperature; positive fluid shut-off by means of dual sleeves and a unique arrangement of high pressure packing; strength to withstand any pressure encountered.

This new cementer incorporates a novel principle of hydraulics; the D. V. in the name referring to differential valve, which is the principle responsible for the successful operation of the tool. Two separate sleeves are housed within the body of the tool. The lower is called the opening sleeve, and it seals off the tool ports during the circulation and passage of cement for the lower stage of the job. The upper is the closing sleeve, and it seals off the tool ports after the completion of the upper stage of the cementing job.

From the sectional view of this cementer, it will be noted that the closing sleeve is made to telescope into the opening sleeve when driven downward by the seating of the top plug. As the upper sleeve moves toward the lower sleeve, fluid is forced from the inside of the tool out through the ports until the moment that the lower sleeve receives the skirt of the upper sleeve. At this time the ports are closed and the differential principle becomes effective. Since the cross-sectional area of the upper surface of the sleeve is greater than that of the bottom surface, the upper sleeve continues to move downward into the lower sleeve because the force downward (pressure times cross-sectional area of the upper surface of the sleeve) is greater than the opposing or upward force (pressure times cross-sectional area of bottom surface of sleeve). The upper sleeve moves downward until it is pressed into and shouldered against the lower sleeve. In this position both sleeves are permanently locked down and against rotation to become a pressure-proof sealing member across the ports.

The operation procedure used with the D. V. multiple stage cementer is the same as with ordinary multiple stage cementing devices except for the use of a plug to actuate the closing sleeve of the



HOWCO DV MULTIPLE STAGE CEMENTER

cementing tool. The first stage of cement is mixed and pumped into the casing, followed by a measured volume of fluid equivalent to the volume of the casing from the D. V. tool to the float collar. The operating plug is placed in the casing followed by the second stage of cement. The closing plug is then placed in the casing followed by sufficient fluid to pump the closing plug to the D. V. multiple stage cementing tool. The first stage of cement flows out of the casing through the casing shoe until the opening plug seats in the D. V. cementer, uncovering the ports in the wall of the tool. The second stage of cement then flows through these ports and upward around the casing until the closing plug engages the closing sleeve and seals the ports. The D. V. multiple stage cementer has found many diversified applications in the field of oil well cementing. The more important are: full depth cementing; reduction of pump pressure; cementing off formation; and reduction of channeling.

Sand-Lac

A PROCESS of consolidating loose sand with a resinous material leaving the sand permeable and with good porosity has been developed by Halliburton Oil Well Cementing Co. This process is rapid and simple, and the consolidating material can be placed in the formation without danger of damage to the well.

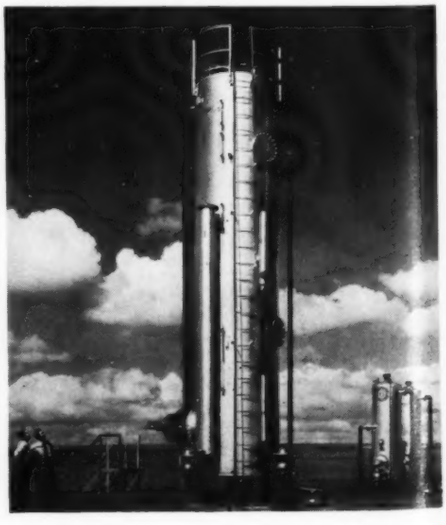
The Sand-Lac method of sand consolidation offers advantages that are present in naturally stable formations. The consolidating material lacquers the individual grains of sand with a thin film of fluid which later sets to a hard bonding material. After the cementing process is completed, very little or no excess material is retained within the interstitial voids, thus leaving the effective permeability of the recemented sand formation in such a condition that it is capable of producing the formation fluids.

Sand-Lac can be applied to any cased and perforated well providing it is clean and free of sediment which could prevent fluid from being pumped into the formation. It may be safely applied through perforations screens or gravel packing providing such filters can be pumped through without abnormal pressures.

The consolidating material is placed in the formation through the well tubing with standard cementing equipment well known in the oil fields. After the well is ready for treatment, only one and a half to two hours are required to connect up and place the material.

Stage Treaters for Crude Oil

BLACK, SIVALLS & BRYSON announce completion of the design of five types of stage treaters with the following features which a successful single-unit treating system must provide: (1) a method of removing all free gas which enters the treaters; (2) a large quiet settling section; (3) a dependable high capacity heating element which is easily removable; (4) an effective free water knockout section; (5) a simple adjustable water siphon; (6) an efficient outside heat exchanger; (7) a gas cycle which minimizes gravity loss by condensing the gas which is driven out of the oil by the application of heat; (8) a design which sim-



Cementer for deep high pressure formations.

plifies cleaning and field maintenance; (9) an accurate automatic temperature controller; (10) a filter section, when necessary, to aid in treating low gravity asphaltic base oils or extremely tight emulsions.

Several types are built. Type "F" is the all-purpose unit. Type "FCW" cold weather treater is especially designed for installation in localities which have low atmospheric temperatures. It is essentially the same as the type "F" in design and operation but all the piping of the treater is placed inside the shell to combat freezing troubles.

The gas-free treater is a unit which is particularly suited to those applications where very little free water is produced. This treater is similar to the type "F" but it does not have a free water knock-out section. Type "KA" and "KP" treaters are inexpensive units which are suitable for the small lease which produces small quantities of free water and free gas. They are very similar in design except that the "KA" unit is suitable for 3 psi while the "KP" unit is suitable for a maximum working pressure of 25 psi.

Howco Super Cementer

ABNORMALLY high pressure formation and deeper wells have brought about the development and manufacture by Halliburton Oil Well Cementing Co. of a new oil well cementing truck, called the super cementer. This motor-driven cementing unit is powered by two 123 horsepower, four-cylinder, two cycle diesel engines placed immediately behind the cab.

Two, triplex, single acting power-driven pumps were especially designed to provide smooth discharge characteristics. Extensive use of magnesium, aluminum and heat treated alloy steels have made possible the construction of this unit which will safely develop in excess of 10,000 pounds per square inch pressure. The capacity and maximum pressure of each pump is such that either pump may be used as a mixer pump or to pump the cement slurry into the well.

Two New Diesel Power Units

INTERNATIONAL HARVESTER COMPANY'S industrial power division has started production on a 125-hp Model UD-18A power unit and a 76-hp Model UD-14A for truck or industrial use. Both units are heavy-duty four-cycle diesels with the same bore and stroke. The UD-18A has six 4¾ x 6½" cylinders, and the UD-14A has four. The UD-18A and UD-14A deliver in full measure considerably more power without increase in weight over the popular UD-18 and UD-14 models which they displace.

A new cylinder head arrangement, improved nozzles, and redesigned precombustion chambers give them higher compression and greater efficiency in converting fuel energy into low-cost power. Since the International diesel starting system does not require preheating of the incoming air even in cold weather, it has been practical to locate the exhaust manifold on the injection side of the engine, away from the intake manifold. As a result, incoming air is kept cooler. Volumetric efficiency or "breathing" ability, is greatly increased resulting in more lugging ability and greater power output with clean combustion.

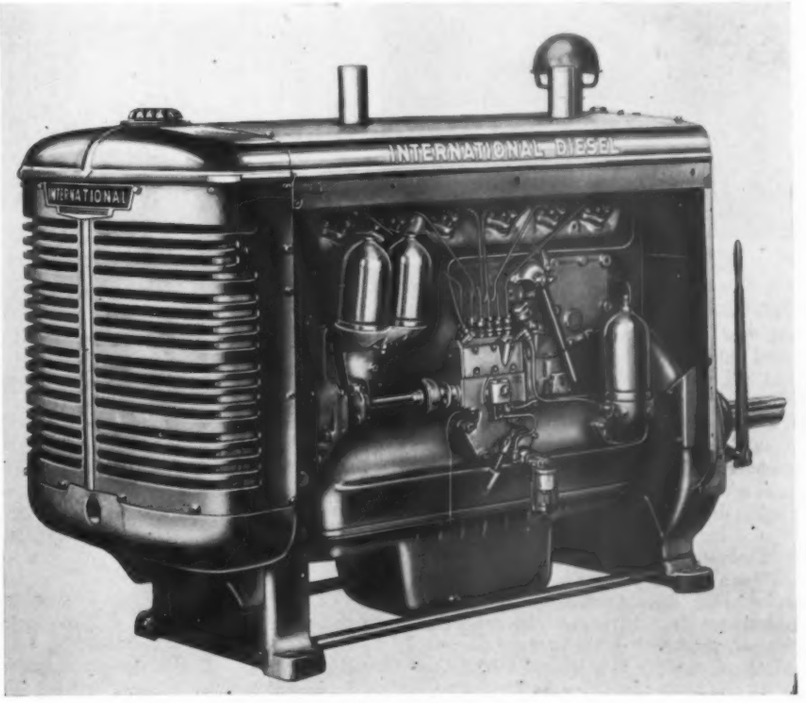
International's integral gasoline starting system has been retained in the UD-14A and UD-18A Diesels. The engines are started on gasoline in the same manner as an ordinary gasoline engine. After a brief direct-flame cylinder warm-up, movement of a single lever changes the engine from the gasoline starting cycle to four-cycle Diesel operation with compression ignition.

Electrical Well Control

BLACK, SIVALLS & BRYSON have announced an electrical well control which allows the operator to control the wells and tankage on his lease from a centrally located switch panel. The entire system operates upon power from a 110 volt AC source. It can be built, upon order, to control any number of wells and tanks.

The heart of the system is a central control panel which mounts a toggle switch for each well and each tank; along with a main line switch which supplies current to the entire controller. The control panel can be furnished with two variations. One variation is the addition of electrically operated tank gaging meters, mounted on the panel, with a remote control float unit installed on each tank. One other variation is the addition of counters on the control panel, connected in series with a counter on a metering separator, to record daily production and total production on the lease.

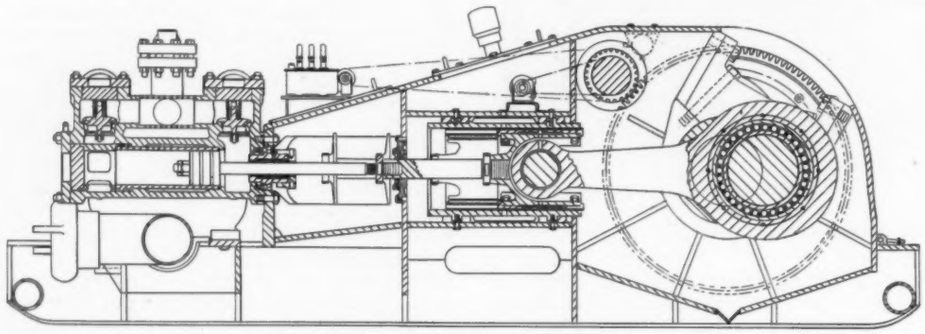
The electrical well control is arranged to care for any emergency which may arise in the operation in the system. All the flow valves in the system will close upon failure of the power supply to the controls. No well flow valve can be opened unless there is a tank open to receive the oil. The system will automatically switch oil flow from a full tank to an empty tank but the oil flow cannot be switched to a tank which is being "run" to pipe line. The well flow valve will close if there is no empty tank to receive the oil. Any



International UD-18A Diesel.

well can be flowed into an empty stock tank by operation of the proper toggle switches on the control panel. Operation of the system is indicated by two signal lamps adjacent to each toggle switch. The first lamp is lighted when the toggle switch is closed to demand the opening of the flow valve controlled by that switch. The other lamp is lighted when the flow valve has actually opened. The two signal lamps might be classified as a "demand" lamp and a "compliance" lamp.

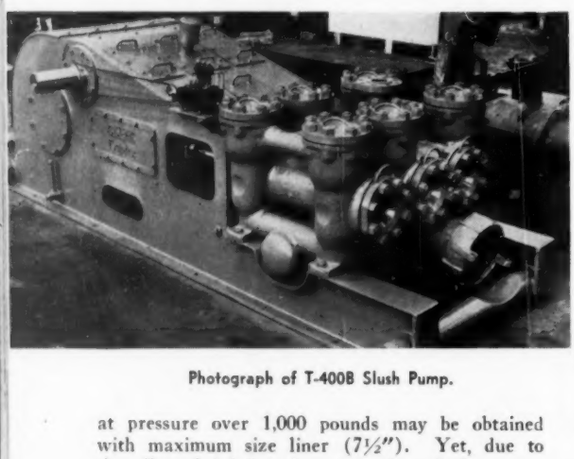
Electrical well control has been responsible for a reduction in automobile driving time by switchers on large scattered leases.



Sectional view of new Clark-Ideco 750 H.P. Slush Pump

To Announce Larger Mud Pump

THE Clark-Ideco T-750 triplex pump (7½" x 15") soon to be announced, was designed by the International Derrick & Equipment Co. to meet the ever-increasing demand for more volume and greater pressure, and also to meet the requirements for less weight and greater portability. This big pump is rated at 750 hp. input capacity at 60 strokes per minute, with 50,000 pound plunger load. Mud volume of approximately 1,000 gpm



Photograph of T-400B Slush Pump.

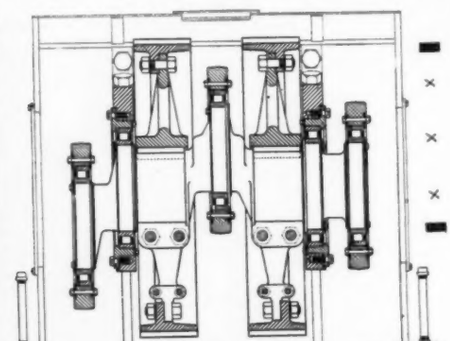
at pressure over 1,000 pounds may be obtained with maximum size liner (7½"). Yet, due to the all-steel fabricated construction of the power frame and the use of alloy steel in all running parts, the weight of this super pump is estimated at only 35,000 pounds. Thus, greater volume, pressure and portability are combined to assure more economical drilling, and at the same time provide smooth, surge-free characteristics inherent in the triplex double-acting type pump.

The entire power frame of this pump is to be fabricated from steel plate, with inboard bearing supports for crank shaft as shown in the accompanying sectional view. Divided, opposed helical gears, clamped and keyed on the oversize cast steel crank shaft, are of alloy heat-treated steel. Connecting rods, one located between the divided gears and one overhanging the inboard bearing on each side, are mounted on roller bearings having double-lipped inner and outer races, thus limiting relative axial movement between rod and shaft. Pinion shaft of forged alloy steel with two divided pinions forged integrally therewith is roller bearing mounted in side plates. Extension of pinion shaft on both sides provides for right and/or left hand drive.

Cast steel cross-heads will be equipped with replaceable and adjustable cast iron shoes and will slide on heat-treated cast iron guides bolted into the frame proper. Oversize needle bearing in connecting rod will operate on hardened and ground wrist pin held in cross-head on taper.

Fluid end of cast steel will be fabricated from individual cylinders and will include welded-in suction and discharge manifold. Cylinders are designed with separate suction and discharge valve pots, with metal-to-metal valve cover joint. Close clearance at each end of cylinder to facilitate suction pick-up is provided.

The new Clark-Ideco T-400B triplex slush pump



Sectional view of crankshaft of new pump showing the inboard bearing supports

(7½" x 12") also is a postwar development rated at 400 hp input capacity at 70 strokes per minute, with 30,000 pound plunger load. The entire power frame, including skids, is fabricated from steel plate into a single element, braced and reinforced to provide a rigid and stable supporting framework for shafts and guides. Excess weight is thus eliminated without sacrificing strength in any part of the frame.

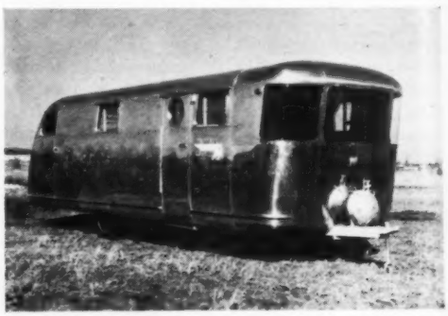
Crank shaft is of unique design, combining standard crank-throw and eccentric construction, which permits the roller bearing mounting of one-piece connecting rods. Crank shaft is supported in the side frames on straight-type roller bearings. A 12-inch face herringbone gear is bolted to a flange cast integrally with the crankshaft and is removable and replaceable without heavy press fits.

Cast steel connecting rods are mounted on roller bearings having double-lipped inner and outer races. The inner race is shrunk and clamped on the crank throw, and the outer race is clamped in the connecting rod bore. Fixed lateral relationship between shaft and rod is thus assured. The three crank throws, annularly spaced at 120° apart, provide the smooth flow and uniform pressure so desirable in slush pump operation.

Spartan Trailer Coach

SPARTAN AIRCRAFT COMPANY is producing an all-aluminum trailer coach based on airplane design. It is, in effect, an airplane fuselage, strong, with no excess weight, streamlined to an extremely fine degree.

Shell Oil Co., Stanolind Oil & Gas, Stanolind Pipe Line Co., Carter Oil Co., Sohio Pipe Line Co., Gulf Oil Co., Phillips Petroleum Co. have found Spartan trailer coaches economically feasible and the answer to "spot housing." Many companies that are engaged in foreign oil work are considering the use of Spartan manors for housing field personnel assigned to these areas. Tropical climates have little or no effect on the Spartan type of construction, yet people living in these trailers have



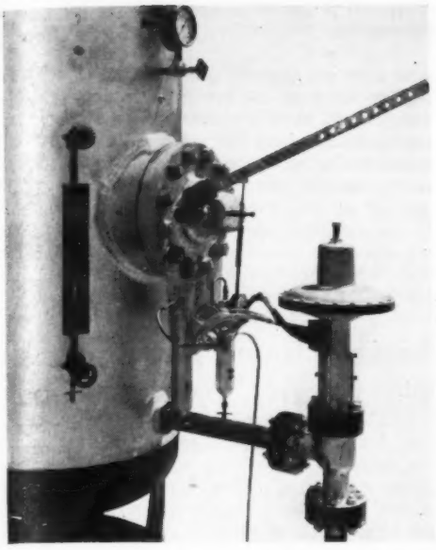
equal or better facilities than are found in many small, efficiency-type apartments that have been used in the past.

The new all-aluminum coach weighs 3,500 lbs. It consists of a large observation lounge, bedroom and galley. Lounge has two chairs, tilt-back divan, dropleaf table with storage space, large cabinet, two wardrobes, venetian blinds and draperies. Bedroom is furnished with full-size bed, vanity, lavatory, wardrobe and medicine chest. Galley is complete with stove, ice box or refrigerator, sink, metal drain board and ample storage space. Sleeps four.

Step Throttling Oil Valve

THE latest development in BS&B separator valve equipment is the Black, Sivalls & Bryson Inc. step throttling oil valve. It was designed for oil and gas separator service without extensive field care and maintenance. This valve is built in the two-inch size in two models for 1000 and 2000 psi maximum working pressure.

The step throttling oil valve is not a true throttling valve throughout its full capacity range. It operates in eight separate and distinct steps in going from the fully closed to the fully open position. The valve is fully throttling at each step, however. There is a break in the capacity curve of approximately 10 percent between adjacent steps. The valve is built to operate step-fashion in order that it may be locked into position at every step to eliminate "hunting."



The primary valve which controls the step throttling oil valve is an extremely sensitive, almost frictionless unit which can be operated by a net force, applied to its lever arm, of only four inch-ounces. This feature is of particular importance in high pressure separators where the oil-gas differential density is small.

The step throttling oil valve will eliminate the violent fluctuations of separator pressure which make meter charts almost unreadable when a snap-acting valve is used. It will produce a steady flow of oil to a displacement meter. It will maintain a fairly constant liquid level in a separator or other pressure vessel. It will permit remote control of the oil discharge valve. It will not "hunt" wildly. It will not require expert adjustment or field maintenance.

Heavy Duty Trucks

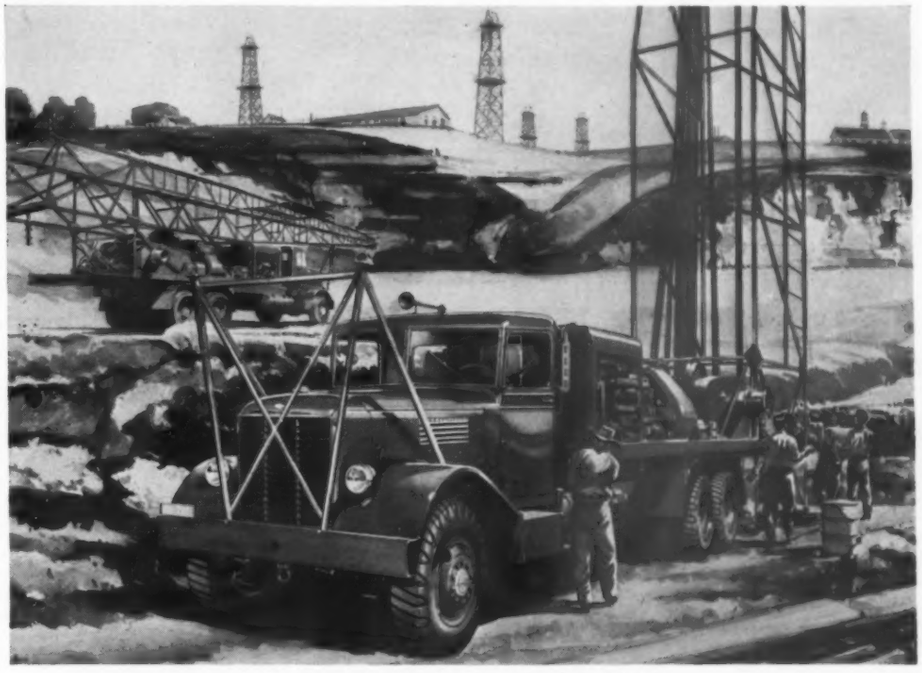
RECENTLY, the International Harvester Company made the first public showing of its new heavy-duty highway and off-highway trucks. The unit shown in the illustration is equipped with a portable drilling rig for which it is especially adapted. This heavy-duty off-highway vehicle is one of six new Internationals ranging from 30,000 to 90,000 G.V.W. rating for both highway and off-the-highway operations and powered by choice of two gasoline and three Diesel engines. Special equipment is provided for both gasoline engines to permit the use of butane fuel.

Optional equipment also includes a choice of eight heavy-duty transmissions of 4, 5 and 10-speed types and four 3-speed auxiliary transmissions of either the direct or over-drive type. The chassis is also available in two types of tandem drive, both especially adapted to off-highway service.

Model W-6564-OH is a 6 x 4 (a 6-wheel vehicle which drives on the 4 rear wheels) has a 749 cubic inch displacement engine, which develops 254 brake horsepower at 2600 revolutions per minute and 585 pound-feet of torque at 1400 revolutions per minute. It was war-tested in a high-speed 13-ton unit.

Other super heavy-duty Internationals recently put in production include the highway Model W-4064-H and the off-highway Models, W-4042-OH, W-4564-OH, and W-9064-OH, which have gross vehicle weight ratings of 40,000, 45,000, and 90,000 pounds respectively.

Although the International-Continental S-6749 engine is listed as standard, all six of the new International heavy-duty models are available with any one of the following optional engines: the Cummins Diesel HB-600, NHB-600, and NHBS-600 (supercharged), and the Hall-Scott HS-400 (gasoline), which is also well known to operators of heavy-duty equipment in the Southwest.



New international trucks range up to 90,000 GVW.

Ful-Flo Square Kelly

THE New Guiberson Ful-Flo Square Kelly is designed for well completions, clean-out work, exploratory and light portable rigs. It is built on a new principle to meet the severe requirements of rotating and supporting the string as well as supplying full flow circulation.

The Ful-Flo Kelly has an inner core of seamless alloy steel tubing inside a tight fitting outer shell of square seamless cold-drawn alloy steel. The inner core and outer shell are securely bonded together to form a one-piece unit. This construction combines greater resistance to bending, lighter weight, more circulation area and a true bore throughout its length.

This kelly feeds more smoothly through the kelly bushing as it has greater stability and does not whip or gyrate in operation due to its perfect balance. It passes easily through the packing rubber. Smooth liner tube walls insure maximum flow with no offsets or restrictions. Opening through 2½" kelly is 1⅝" dia., through 3" kelly 1¾" dia. Final inspection includes 3,000 psi hydrostatic test.

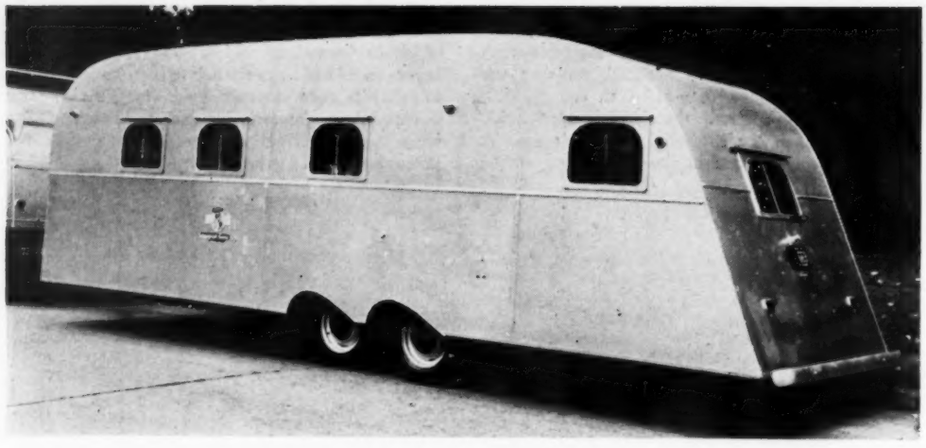
Unitized Tubing Block & Hook

THE new Guiberson Corporation unitized block is compactly built for short derricks, portable rigs, clean-out and exploratory work. It simplifies rigging up since lines may be reeved into the block without disconnecting the hook. The block is easily opened by removing the guards and one pin. Loads are carried in perfect balance and the streamlined body has no protruding bolts or sections to hang up or cause injuries.

The hook may either swivel freely or be locked in any one of eight positions. The hook link carries a proportional part of the load, eliminating flexing and fatiguing of the hook, under repeated heavy loads. The hook link is securely locked when closed. Size is 48" overall height, 10" thick and 25" wide. Rated capacity is 45 tons.

Cable Tool Bit

THE HINDERLITER TOOL CO., division of the H. K. Porter Co., Inc., announces the introduction of its new H-P hialloy cable tool drilling bit. The bit is forged from a bit steel material with high abrasion resistance and shock absorbing qualities. The bit is now available in sizes ten inch and smaller.



Trailer Laboratory for desert seismograph crew.

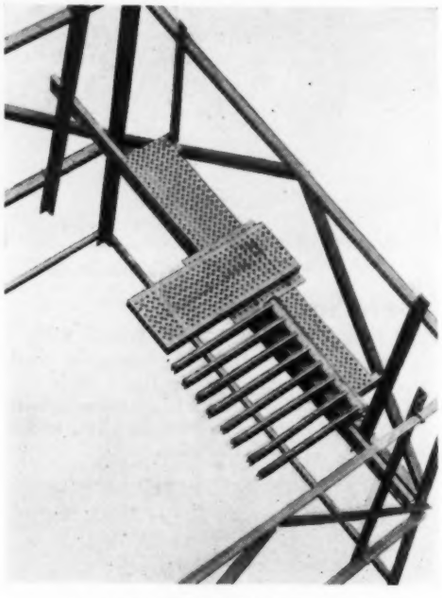
Desert Seismograph

TO solve the exacting problems involved in desert exploration Seismograph Service Corporation has designed a special field laboratory which is completely self-contained. Technical and interpretational experts now are in the field with this new equipment. The accompanying photograph shows the four-wheel trailer in which the mobile laboratory is housed. The trailer is drawn by a SSC 24-trace recording unit truck designed for desert use and operation in sand.

Adjustable Finger Boards and Sub-Structures

LEE C. MOORE & CO., INC., has announced the production of finger boards for standard derricks which are designed for an almost infinite range of adjustment and rearrangement within the working space of the derrick. The boards are constructed of punched plated flooring framed with structural steel sections. They are adjusted vertically between two adjacent girts. Special design of the finger board, finger, hinged rake and working platform permits the variety of arrangement on the horizontal plane.

Another Moore contribution to unitization of drilling equipment for economical portability are the adjustable rig substructures which are applicable to most drawworks and powers. A variety of length, width and height is possible by using different models and combinations of units. One group of units has a standard height of 8′ 4″ but where additional height is desired two other types will permit heights of 10′ 4″ to 16′ 4″ in 2′ increments.



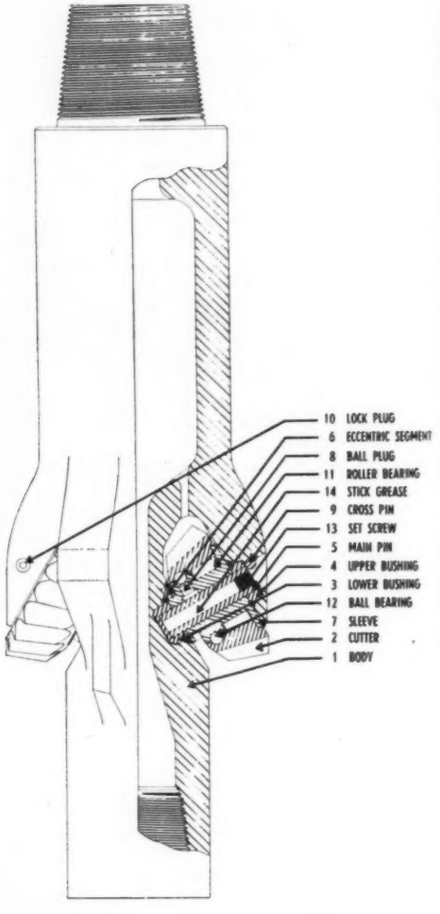
Lee C. Moore adjustable finger board.

Adjustable rig sub-structures facilitate rig moving.

The units are designed for maximum capacity and rigidity as well as ready portability as units. Longitudinal slabs are shop welded sections with lateral braces bolted into place. The heavy welded frame resting on the back of the unit can be moved readily to give any required length between 17′ and 22′ on one style and 22′ to 27′ on another. In the extended positions the heavy double channel adjustable braces are used to support the rear end. These braces also serve as skids to facilitate loading the substructures on trucks.

Security Hole Opener

THE SECURITY ENGINEERING COMPANY'S hole opener, demountable design, Model "46" has been completely re-designed to eliminate the necessity for welding equipment in changing cutter assemblies. The new demountable type allows the cutters to be changed on the rig by the use of simple hand tools.



In the improved construction, the arms which locate and hold the cutters in place are an integral part of the body. The cutters are mounted on a hardened sleeve with roller and ball bearings between the cutter and sleeve. The sleeve is held in proper position within the body by means of a main pin which passes through the sleeve and extends into the inner portion of the body as well as the arms. An eccentric flange on the inner end of the sleeve locks the sleeve against rotation on the pin. A cross pin is inserted in the arm at a point directly above the main pin and is held in position by a pipe plug. This cross pin completes

the locking device and prevents the main pin from becoming dislodged.

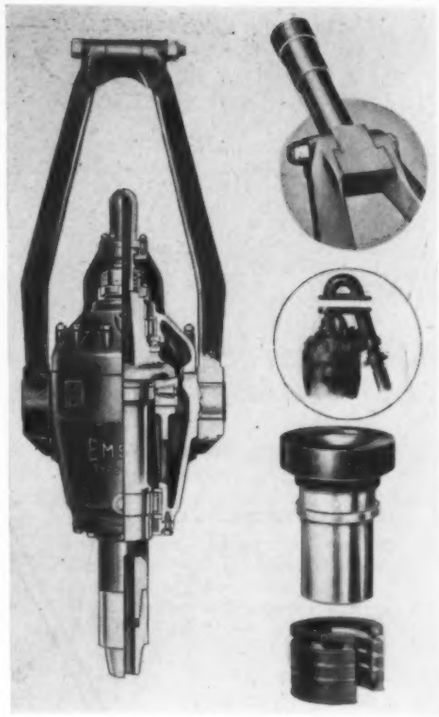
A novel and simple method of disassembly has been employed in this construction. In order to remove the main pin, which at times becomes cemented in place by drilling fluid or rust, a hydraulic ejection method has been devised.

Mercury Hole Openers

MERCURY hole openers are built to ream out or open to larger size small holes drilled ahead of the main hole. In coring operations, for example, it is a frequent practice to core ahead with smaller sized hole than that of the initial bore, later enlarging it to the depth where it is desired to seat a formation tester. The piloted reamer is the ideal tool for this purpose, as it cuts a shoulder having perfect concentricity with the pilot bore. The bottom end is made with box or pin so a dull coring bit or digging bit may be used as the pilot.

Operators who have welding facilities can quickly and easily replace worn cutter on Mercury hole opening reamers. This is especially important when drilling in foreign fields as it eliminates the need for ordering complete new reamers for each job, thereby reducing drilling expense.

The arm, bearing and cutter are assembled as one unit. Therefore the change is made merely by cutting off the worn arm and cutter assembly with a cutting torch and welding on the new one. These openers come in sizes 9½" to 13¾".



New Oil Field Swivels

THE manufacture of a new series of oil field swivels has been announced by Emsco Derrick & Equipment Co. These new swivels, known as the Emsco JV series, are designed for medium and deep drilling. Several totally new and unusual design features have been incorporated. Outstanding among these are: a two-piece, demountable steel bail; simplified hose connections permitting packing replacement without disconnecting hose; venturi-type wash pipe and sleeve; cartridge-style wash pipe packing; and maximum vertical spacing at the radial roller bearing which maintains positive alignment of sleeve and packing assembly with wash pipe.

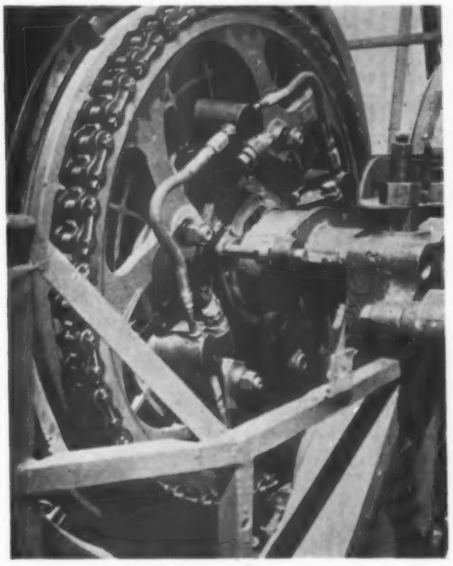
All JV swivels have the new demountable steel bail which can be readily converted from the conventional or hook type to that using the elevator shank as shown in the accompanying illustration. The tapered design of the bail arms distributes load stresses equally. Easy removal of bail arms permits field repair and assembly. Due to precision design, close trunnion fitting is possible, eliminating excessive wear between trunnions and bail.

The new gooseneck is designed for removal without uncoupling the mud hose. This permits easy replacement of wash pipe packing. The fluid channel through wash pipe and sleeve assembly (see cut-away illustration of swivel) is designed to afford a venturi type passageway. This considerably increases life of wash pipe packing by inducing a high velocity, low pressure area adjacent to packing. A special, factory assembled cartridge-style packing has been designed so that the sealing lip of each ring acts free and independently from the others (see cutaway view of packing), all pressure being absorbed by the solid outer portion of the ring rather than compressing the entire packing. Being factory assembled in cartridge form and designed to prevent improper installation, this new wash pipe packing eliminates all replacement difficulties.

Hydraulic Clutch Dogs

THE Franks Manufacturing Co. is announcing new and improved combinations and applications in drives, clutches and controls. Among these are the hydraulic clutch dogs illustrated by the accompanying photograph, showing a new, highly simplified, positive means of obtaining automatically equalized clutch plate pressure adjustment at all four adjusting points, or dogs. It is the product of exhaustive field tests over a period of four and one-half years. It has now been adopted as standard equipment on models 5000 and 7000 winches.

The feature of this system is a hydraulically actuated clutch adjustment, combining four clutch dogs, interconnected by high-pressure metallic hoses, all

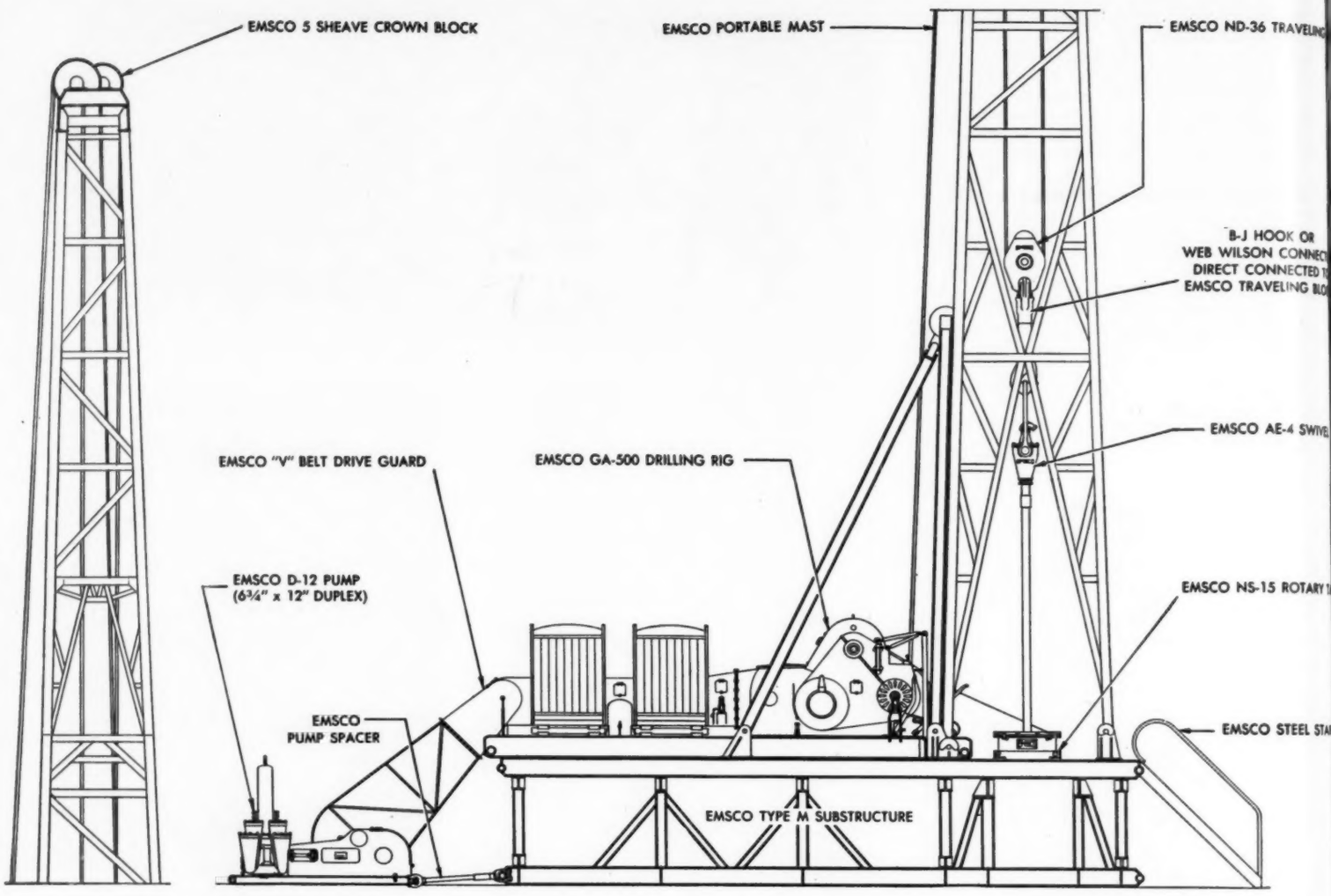


dogs of which are adjusted simultaneously and equally by pressure from a grease gun applied to one alemite fitting. A bleed-off valve is also provided for reduction or diminishing of pressure when desired. All models 5000 or 7000 in current service with old style or manual screw adjustment may now be equipped with the hydraulic clutch dogs without basic change.

Ball Bearings

ACCORDING to Fafnir Bearing Co., the petroleum industry oil field and refinery men are showing interest in certain types of ball bearings which heretofore have been used largely in plane controls. These types are characterized in general by their adaptation to oscillating motion, their suitability to transmit rotary motion into reciprocating or oscillating motion, their versatility in providing ball bearing smoothness where high speed rotation is not demanded.

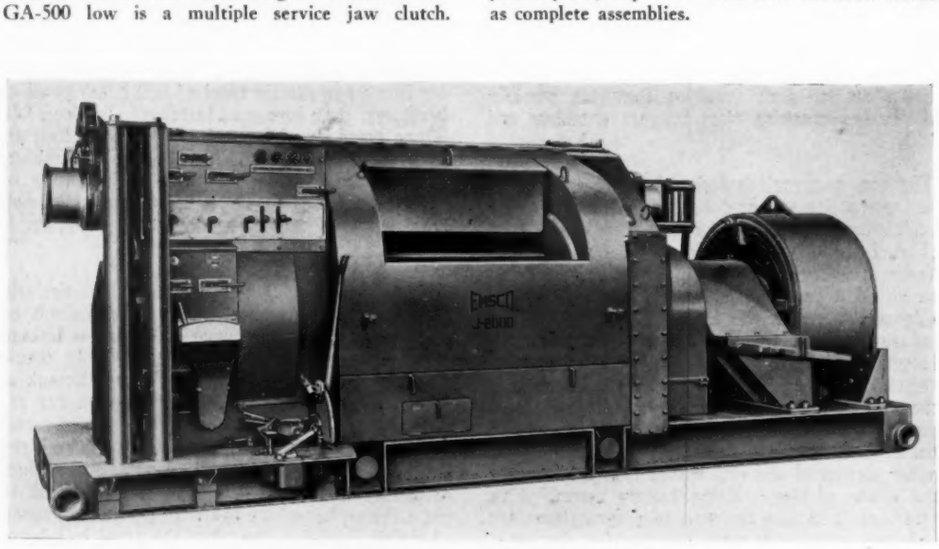
The rod-end bearing is being studied particularly because of possible adaptation to the controls of stationary and movable power equipment, to linkage or pivot assemblies where motion must be transmitted in a different direction. The bellcrank is suitable for transmission of rotary motion into reciprocating or oscillatory motion, or vice-versa, providing friction-free positive linkage. The high-load ball bearing is ideally suited for a rolling, oscillatory assembly where high speed rotation is not a factor, but where ability to take more pounds of weight, size for size, than the usual ball bearing, is important.



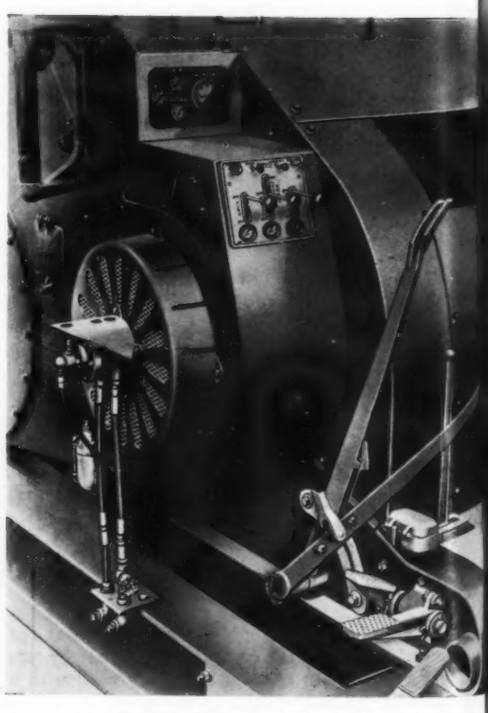
Emsco GA-500 drilling rig with portable mast.

Latest Emsco Drilling Rigs

THE type GA-500 is the newest drilling rig designed by Emsco Derrick & Equipment Co. The ability to drill oil wells faster and hence more economically was the dominating influence in the new design. This rig is air-controlled, making use of twin disc direct air-operated friction clutches and Fawick airflex engine clutches. The GA-500 low is a multiple service jaw clutch. Direct air-operated friction clutches provide smooth, high speed operation at all times and eliminate the fighting of mechanical controls. A flip of the proper air valve does the work. All parts of the rig are readily accessible. With the exception of the pump drive, the friction clutches are mounted on the ends of shafts to facilitate their servicing. The shaft assemblies, complete with their component parts, may be removed from the draw works as complete assemblies.



Emsco J-2000 rig designed for 20,000 ft. drilling.



Centrally located controls on GA-500 rig.

The draw works and compounding transmission are mounted on a well-braced skid base made strong enough to permit the operator to transport the entire unit with draw works and compounding transmission mounted. To bring the draw works to within eight foot road clearance, it is necessary to remove only the two catheads, the two engines, and the extended rope roller. The draw works and the transmission remain on the main base. It is not necessary to break any chains or to remove any chain guard. This means saving hours in dismantling and rigging up time. The engines are easily removed by simply removing the bolts which secure them to the main base. Special stops are provided to facilitate reassembly of the engines and to insure perfect alignment. All the floor space around the engines and the draw works is covered with removable floor plates. All main shaft and sprocket bearings and chains are force-feed oil lubricated. All chains are totally enclosed and forced-feed oil lubricated.

The draw works engine and the mud pump controls are centrally located at the driller's position. The clutches of the built-in selective transmission are controlled by a quadrant type speed selector at the driller's position. An air-operated neutral brake halts shaft rotation to facilitate shifting of jaw clutches in the selective transmission and to stop rotation in the event of an emergency. The automatic cathead is foot operated. The compounding jaw clutch is hand controlled at the compounding transmission. A second control valve is provided with a two-way safety valve at the pump sheave, making it possible to control the pump clutch either from the driller's position or at the pump sheave.

The instrument panel is located at the driller's position. It has an air pressure gage which shows the line pressure at all times; a water pressure gage and a lubricating oil pressure gage. A dual vacuum gage is provided with all gas or gasoline engines and a pyrometer with diesel engines.

The sheave is mounted on the engine side of the transmission in order to keep the rig within eight-foot road clearance. The pump drive is a 20-in. pitch diameter, 14 "D" groove sheave, keyed to the pump countershaft. The pump countershaft is mounted on self-aligning bearings, and the bearings are forced feed oil lubricated. The clutch is a P-318 direct air-operated twin disc mounted on the pump countershaft inside the transmission case.

The Emsco type GA-500 power rig is equipped to use a 36-in. hydromatic brake. The hydromatic brake is skid mounted with a fluid tank and fluid level control. The rotary side of the drum shaft is equipped with a fixed jaw clutch as standard equipment. The end of the hydromatic shaft is splined and fitted with a sliding jaw clutch which can be engaged with the jaw clutch on the end of the drum shaft. The control for the jaw clutch is located near the hydromatic brake. This entire unit can be bolted to the main skid of the draw works and perfect alignment is maintained through oversize taper pins.

High-Speed Dirt Mover

A NEW small scraper for high-speed dirt moving, the Model D, has been developed by R. G. LeTourneau, Inc., to add to its line of rubber-tired earthmoving and construction equipment. Powered by an 85 hp gasoline engine, it is equipped with a scraper having a load limit of 4 tons and a struck capacity of 3.3 yards. The unit is self-loading, has 4 speeds forward, 4 reverse, and travels up to 23 miles per hour. One of the outstanding features is the new electric control by individual electric motors—a revolutionary operating principle which replaces conventional tractor steering and gear shift levers. It also eliminates the need of a power control unit for scraper operation. Operator steers, shifts and handles all scraper controls by buttons on the electric control panel.

Long wheel base FWD truck with center differential.

The D Model has a new type differential which keeps both wheels pulling at all times. The design is such that on slippery going the most power is supplied to the wheel on firmest footing. Neither wheel will spin independently of the other.

A high-speed bulldozer also has been announced as the first machine of its kind to make its appearance in the heavy equipment industry. Model C Tournadozer is powered by a 160 hp. diesel engine. It has four forward and reverse speeds ranging up to 12 m.p.h.

Based on common earth excavation and 60-minute operating efficiency, the Tournadozer can move 184 cubic yards an hour on a 50′ haul; 118 yards on a 100′ haul; 66 on a 200′ haul; 46 on a 300′ haul; and 35 yards on a 400′ haul.

Shrink Thread Drill Pipe

THE NATIONAL SUPPLY COMPANY Spang-Chalfant Division, have this to say about their recent offering of shrink thread drill pipe with replaceable tool joints: On shrink thread drill pipe there can be no last engaged thread failure arising from runout threads. The root diameter of the pipe thread at the runout is equal to or greater than the outside diameter of the pipe. Every pipe thread is engaged, and its root is supported by a tool joint crest. The notch effect at the bottom of the conventional "vee type" threads is eliminated.

No lubrication is used on the shrink thread joint. Thus, extremely high torsional resistance to movement is developed between the broad, accurately machined thread surfaces. The curved pipe seal surface mates with the conical tool joint seal in near line contact. The high unit seal pressure that develops during shrinking causes the two surfaces to mate over the full circumference so completely that the seal will withstand a pressure greater than that required to burst the pipe.

Rugged Oil-Field Trucks

ALTHOUGH all the FWD models of the Four Wheel Drive Auto Company's trucks are adaptable to heavy duty oil field service, they are calling special attention to their latest "M6X6" as the most representative of their equipment in this market. The heart of these models is the exclusive FWD center differential which distributes power to all wheels.

The FWD "M6X6" series comes in two variations, the "M6X6" long wheelbase, and the "M6X6DT" short wheelbase, or tractor-type, models.

The FWD "M6X6DT" finds its most popular use among the services requiring a rugged tractor-type truck. This model is equipped with the sturdy FWD fish-plated and reinforced frame, double-reduction axles, two-speed transfer, and is powered by the 150 horsepower diesel engine. Wheelbase is 180¼".

The "M6X6" long wheelbase unit is adaptable to a wide range of oil field services, such as the mounting of portable drill rigs, special machinery, boilers, etc., as well as transportation of materials, sand and gravel, cement, etc. The FWD "M6X6" is available with either gasoline or diesel engines ranging from 150 to 186 horsepower, and the standard wheelbase is optional according to the operators' preference.

New Rotary Hose

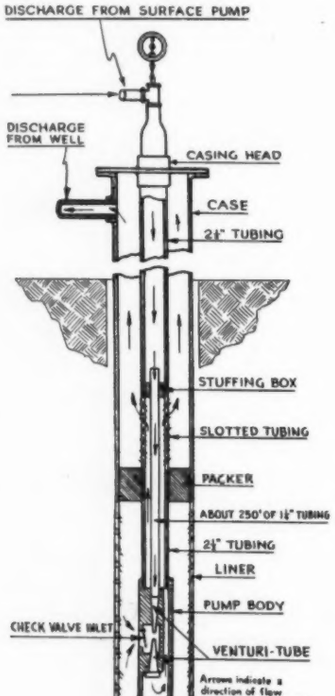
A NEW method of manufacturing rotary hose which gives the hose increased strength and flexibility has been developed by United States Rubber Co. The key to the new technique—called Unitension—is a special machine which winds the main pressure-resisting wires around the rubber and fabric carcass at a scientifically determined angle. By controlling the tension on each individual wire during this operation, the tension on all wires in all plies throughout the hose is equalized, and placement of the wires is uniform.

New Oil Choke

PERMAFLO CHOKE (or flow bean) developed by Schick-Siegal Industries is an oil choke that will not "cut-out." Essentially planned for "hard to hold" wells with fast high pressure "cut-outs," this flow bean has been manufactured to resist wear from abrasion such as sand flowing at high pressure. A bronze sleeve is used with a platinum gold thermide seal and the liner is of wear resistant porcelain.

Producing Oil with Venturi Tube

THE arrangement of an unique oil pumping system designed and manufactured by the McMahon Manufacturing Co. is illustrated in the accompanying diagram. A vertical triplex pump at the surface circulates oil throughout the entire system by discharging the circulating oil through piping to a 2½-inch upset tubing, thence to an annular chamber down to the bottom hole pump, comprising the venturi-tube. Partial vacuum is created in the entrance chamber of the bottom hole pump by the venturi-tube. This vacuum action entrains the natural oil and/or natural gas into the venturi-tube and a macaroni-tube where the natural oil and/or gas intermingles with the circulating fluid, and both volumes of fluid are conveyed together up through a reversing manifold and discharged into the annular chamber, which is formed by the oil well casing and the 2½-inch upset tubing.



From the annular chamber both volumes of fluid discharge into a pipe line and are conveyed therein to a gas trap. After the gas is separated surplus fluid is automatically conveyed to the storage tank. To prevent time lost due to a sanding-up, a reversing of the flow of fluid through the entire system or unit located in the oil well is provided for by means of valves. This reversing flow of fluid does not change the direction of flow through the surface tanks and/or surface triplex pump. It merely reverses the flow in the system located in the oil well.

The annular chamber is formed by the setting of a conventional packer in the upper blank portion of perforated casing. This packer serves to keep the hydrostatic head pressure off the formation and to keep the oil well from heading. It eliminates the need of a string of macaroni-tubing, and serves to provide large passageways through which the fluid may flow. The prime is maintained in the system by means of a foot valve, which is opened at all times when the pump is being operated. When the pump is shut down, a valve closes instantly.

The average cost of operating a 7020 ft. well at a mean average pumping level of 5000 feet on the basis of 200 bbl. per 24 hours, using a 20 hp. electric motor is figured at $0.018.

Spudder has 6000-ft. capacity.

Larger Mobile Spudder

AN all-steel spudder that drills oil and gas wells top-to-bottom to 6000 ft. and handles a wide range of servicing operations to 7000 ft. has been added to the Bucyrus-Erie Company's line of mobile spudders. The new machine, known as the 48-L, has been announced to the oil industry as a unit that fills an oil field need previously unfilled. It is bigger than any other spudder in the line, but retains the mobility characteristics of the smaller machines and is available as a semi-trailer or on skids for truck transportation.

Up to 5000 lbs. of tools can be swung on the 60-ft. derrick, which is an all-steel cantilever-braced telescoping box structure that is power-raised and extended by a built-in winch. Erecting the derrick requires only an hour, the manufacturer says. For handling exceptionally heavy casing loads, an extra casing tackle arrangement gives the derrick capacity for handling up to 120,000 lbs. static load.

A four-reel machine, the 48-L has spooling capacity of 12,000 ft. of ⅞-in. drill line and 12,200 ft. of 9/16-in. sand line without divider. The calf reel spools 1390 ft. of ⅞-in. casing line and the calf reel storage drum spools an additional 1200 ft. The bull reel and sand reel are equipped with non-chafing dividers. Fast line speeds and powerful line pulls are performance features of the drums, which provide two forward speeds and one reverse on four reels. Accurate positive braking is provided on all drums by friction brakes augmented by a hydromatic braking arrangement.

Automatic spooling of the drilling line is provided by the oscillating heel shaft and the spudding beam sheave, which is mounted on a swiveled bracket to prevent excessive offleads. Deflected sheaves for the sand line and casing line make spooling of these lines automatic also.

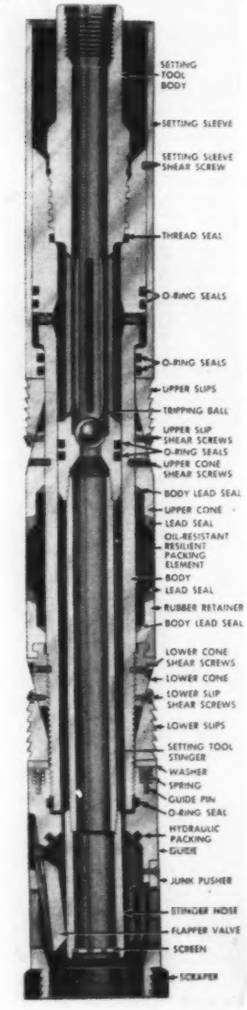
Operation of the machine is controlled from the drilling end of the machine, where all levers are conveniently grouped.

Retainer Production Packer

THE BAKER OIL TOOLS retainer production packer and accessory equipment provides a means of isolating one or more zones for multiple-zone production; for segregated gas injection; for protection of casing from the effects of pressures or deleterious fluids; for selective acidizing, and/or testing, especially just prior to dual completion; for safety in completion of high pressure wells, leaving mud in annulus if so desired; or for any other purpose requiring the isolation of a zone when casing or lining is adjacent thereto.

The packers are not of the retrievable type but are made of drillable material and are readily drilled up when their removal becomes necessary. The hydro-ring set principle of setting is incorporated in the model "D" which permits a uniform setting of the slips and prevents the possibility of placing the packer in a bind when the pull-up strain or other forces are applied to the body.

The packer body has a continuous smooth bore with no internal seals. It is provided with a box connection at the upper end with left hand square threads by means of which the setting tool is connected to the packer. On the bottom of the packer is a flapper valve which provides a fluid-tight seal closure that seals off the lower end of the packer and casing in which it is set, except when tubing extends through the packer.



Full Gauge Removable Whipstock

THE Eastman full gauge removable whipstock is a whipstock which has been especially designed for use with a drilling bit larger than that used with the conventional removable whipstock. The hole drilled by the bit is slightly smaller than the gauge of the bore itself, so that it is both practical and easy to follow the hole made by the whipstock bit with a conventional full gauge drilling setup. The whipstock itself is quite similar in design and construction to the Eastman regular removable whipstock.

The drilling procedure used on a full gauge whipstock run follows very closely the method used with the conventional whipstock. The whipstock is oriented in the hole, the pin is sheared and the bit drilled slowly ahead down the face of the whipstock. When ten or more feet of hole has been made below the whipstock, the bit and whipstock are withdrawn.

An open hole single shot picture may then be taken to check the direction of the deflected hole; or a conventional directional drilling setup can be run into the well, and after a few feet of new hole has been drilled ahead, an inside single shot picture can be taken which will show the direction and drift of the deflected hole. This last procedure saves the time which would otherwise be necessary to check the results of the whipstock run by the use of an open hole single shot instrument, and if the inside single shot recording shows the run to be acceptable, the operator is in a position to drill ahead.

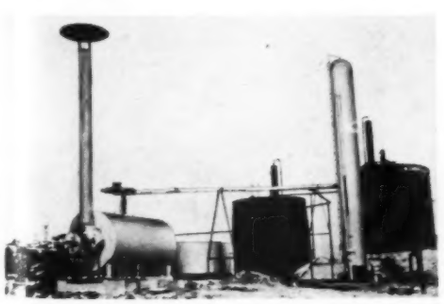
The non-magnetic drill collar combined with the use of the inside single shot lends itself admirably to full gauge deflection work, and is especially applicable in operations using the full gauge deflection tools. The Eastman full gauge removable whipstock is offered in the larger sizes, and is ordinarily run in conjunction with rock bits.

Portable Welder

A NEW self-powered arc welder, designed for shop, yard and field service, is now offered by Harnischfeger Corporation. It is available as a stationary or trailer unit with an N.E.M.A. rating of 200 amperes, but has a welding service range of from 30 to 260 amperes. Engine and welder are securely mounted on an all-welded frame of steel tubing and angle iron. The trailer model has been engineered especially for use in the field. Carried on a running gear of standard track width, the trailer welder has standard size pneumatic tires as regular equipment.

Oil Field Unit Heater

BUTLER MANUFACTURING CO.'S new heater is the horizontal tank type with a horizontal immersion "U" tube fire box. Fire tile is employed only at the front of the tube where it prevents the play of the flames directly on the steel tube and the cooling of the gases in the firing zone. This avoids hot spots and incomplete combustion of late burning gases. It also acts to prevent explosion and thus damage to the heater in the event of temporary cutting off of the fuel.



After complete combustion in the firing zone, the hot gases must travel the length of the heater and back again. Fins in the large return tube recover the heat from the gases and transfer it to the emulsion. These fins are arranged so that they do not baffle; thus, stack temperature is reduced to a practical minimum to avoid excessive heat loss and yet prevents condensation in the stack. The stack is of ample diameter to take care of the product of combustion of low heat fuel gases and the damper allows the effective area to be reduced for gases with a high heat value.

Both the fire tube and inlet tube may be completely removed for cleaning. Outlets along the bottom of the inlet tube distribute the flow and are large enough to let particles of sediment through. Removal of the inlet tube permits removal of all sediment by scraping and flushing through the drain outlet. A large clean-out opening at the top of the rear head facilitates cleaning the top of fire tube without removing it.

Unit Pumper

NATIONAL SUPPLY COMPANY'S latest style in oil pumping equipment is its Type D-21 unit pumper. Purchasers can have their choice of various specifications, including two sizes of gear reducers (either single or double reduction), two styles of main bases, and an arc or rein type of hanger on a long center walking beam. There are 16 possible combinations of the various elements. It may be used with low, medium or high-speed prime movers.

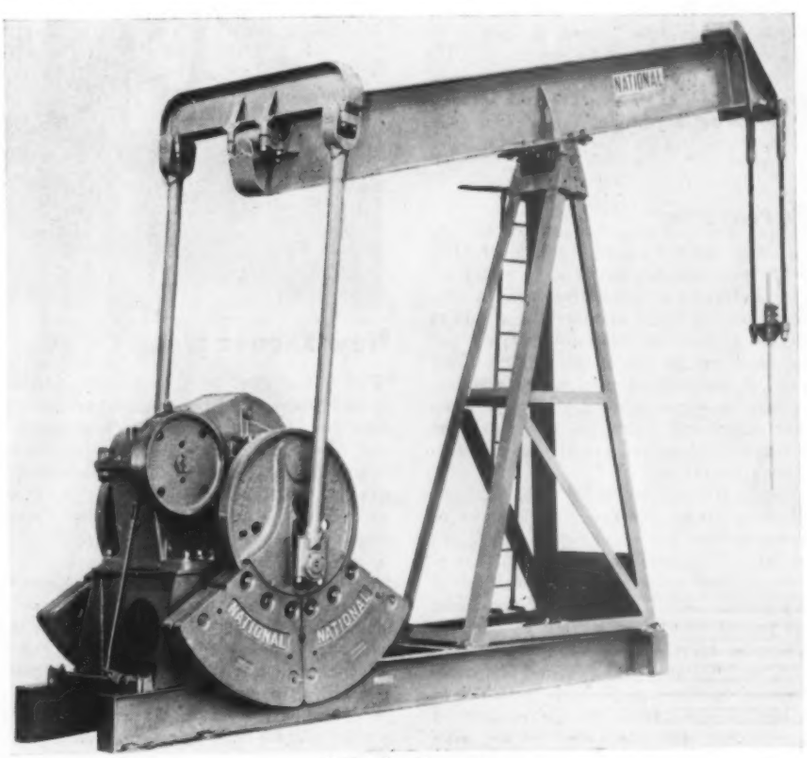
The main base, is made in two styles to accommodate different methods of installation. If the unit is to be mounted on a concrete base sufficiently high to clear the counterweighted cranks, the gear reducer is fastened directly to the girder sections of the main frame.

The prime mover is mounted on a specially designed extension base, which bolts to the main frame. Six leveling screws in the base simplify leveling and grouting the pumper on the foundation. A simple method of aligning the hanger over the well to compensate for slight errors in erection is provided by shifting the entire beam along the slotted (2½" adjustment) walking beam saddle by means of four adjusting screws. Alemite fittings for all bearings are provided for maintenance of proper lubrication.

Outside Tubing Packer

WHEN a break-through occurs in the tubing of water input wells, Larkin outside tubing packers will prolong the life of the well by packing off leaks around the outside of one and a half or two inch input string; by insuring full size opening of tubing; by eliminating use of smaller pipe and pony packers; and also by removing possible necessity of the expensive operations of drilling out tubing and cement.

The outside tubing packer is run in the hole on three-inch tubing over the cemented tubing in the hole to a point below break-through. It may be run also on two-inch tubing by the use of a swedge nipple, if tubing is cut off in the hole. Packer is then set by turning to the right sufficient number of turns to pack or set up packer. Setting action is created when outside shell is screwed down over body shell, bringing rubber into contact with outside of input string. The three heat treated arched springs are designed to engage wall of the well as packer is set up. Ball bearing assembly in the head permits free turning operation of the letting in string.



National unit pumper.

Hydraulic Paraffin Control

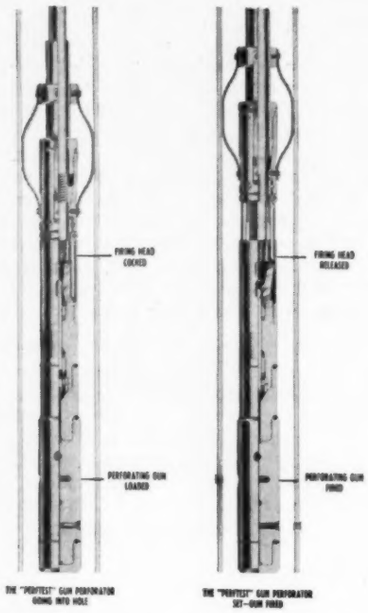
A NEW method of controlling paraffin in pumping wells, where wax is production problem, is announced by Kobe, Inc. It consists of a hydraulic lift to raise and lower a series of scrapers positioned in the production tubing. Operation is controlled by two valves at the base of the lift. When the top one is open and the bottom closed, the power oil flows through the top of the lift and down the well to actuate the pumping unit in the production tubing. When the bottom valve is open and the other closed, the power oil flows through the bottom of the lift, forcing the piston, attached to the top of the power oil tubing, upward in the lift. This moves the scrapers on the power oil tubing through the paraffin zone, loosening the wax, which can then be pumped from the well.

Gun Perforator

THE Johnston Perftest all purpose gun perforator is the newest field-proven addition to the oil field tools designed and manufactured by the M. O. Johnston Oil Field Service Co. Function is to furnish a safe, mechanically-operated gun perforator which can be run in the well on tubing or drill string and can be used either for perforating alone or, when attached to the Johnston pressure recorder and formation tester, as the perforating unit in combined perforation and formation testing operations.

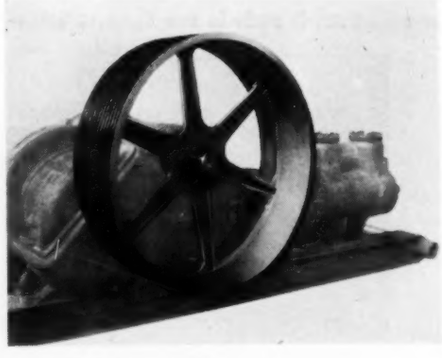
For perforating casing the device is lowered to the zone selected on the bottom joint of tubing or drill string. It consists of a mechanical firing-head to which may be attached any number of perforating gun sections. Each section fires four, five or six bullets to form a pattern of perforations 90 degrees apart with a vertical measurement of 2¼ in. from center to center. The number of perforating gun sections to be attached to the firing-head depends solely on the number of perforations desired and the extent of the zone to be perforated.

By unitizing the perforator with a regular formation tester and pressure recorder, any designated formation can be perforated and tested on one round trip of tubing or drill string. For this operation the perforator is attached to the bottom of the formation tester and pressure recorder.



THE "PERFTEST" GUN PERFORATOR GOING INTO HOLE — THE "PERFTEST" GUN PERFORATOR SET—GUN FIRED

Simple top-hole manipulation of the string by the driller fires the gun perforator to perforate casing and actuates the tester assembly to test formation immediately following perforation, enabling the operator to obtain complete information on water shut-off, exploratory testing or actual production in one round trip of tubing or drill pipe.



New Sheave Lines

TWO new lines of QD sheaves, featuring improved groove-belt fit and reinforced arm construction, have been announced by Worthington Pump and Machinery Corporation. Designated as the A and B lines, each will feature individual groove size to match belt size—thus an A groove for an A belt, a B groove for a B belt. Former A-B combinations have been discontinued.

Like the "I" beam construction of a bridge girder, the reinforced arm construction of the new Worthington QD driven sheave incorporates a longitudinally ribbed arm recessed down the middle. Advantage of this type of arm is that material is removed at or near the neutral axis where it adds little or no strength to the arm. This material is then added at the points most remote from the neutral arm where it gives the greatest strength.

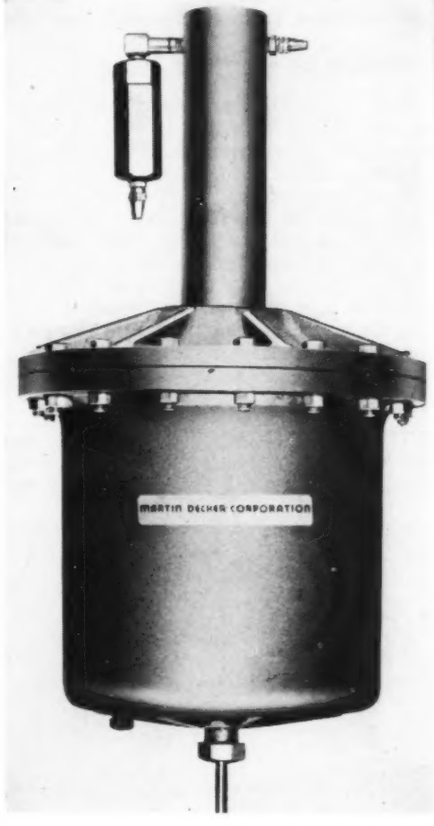
Hydraulic Pressure Booster

A HYDRAULIC pressure source for testing and calibrating is a serious problem. Reciprocating and centrifugal pumps, hand screws, etc., are difficult to keep from leaking, and it is almost impossible to maintain a predetermined pressure without constant manipulation. Maintenance of drives, motors, engines, belts, gears, clutches, etc., becomes an expensive and tedious task, particularly on pressures in excess of 3,000 lbs.

The Martin-Decker hydraulic pressure booster is designed to overcome those problems and continues to generate hydraulic pressure for long periods without maintenance or attention. The booster is operated by factory or city water pressure or by air pressure. No engines, motors, pumps, or belts are needed, and the instrument can be installed on the wall or under a bench.

The booster consists of unit pistons which operate in unit cylinders. The pistons are packed with a new type of sealing member which is low in friction but which will positively not leak. Control is effected manually by means of the conventional needle valves which allow low pressure from the pressure source to enter the lower booster cylinder. As the cylinder is forced upward, the high pressure cylinder generates and discharges high pressure in the exact ratio to piston areas.

Pressure can be generated to any desired point up to 25,000 lbs. depending upon pressure available for operation and area ratio of pistons. Three types are available: 5,000 and 10,000 lbs. discharge pressure for operation on plant pressures of 150 lbs. air or water and 25,000 lbs. discharge pressure for operation on 225 lb. plant or source pressure. Martin-Decker pressure boosters are fast and economical for testing Christmas trees, valves, fittings, blow-off valves and for instrument calibration.



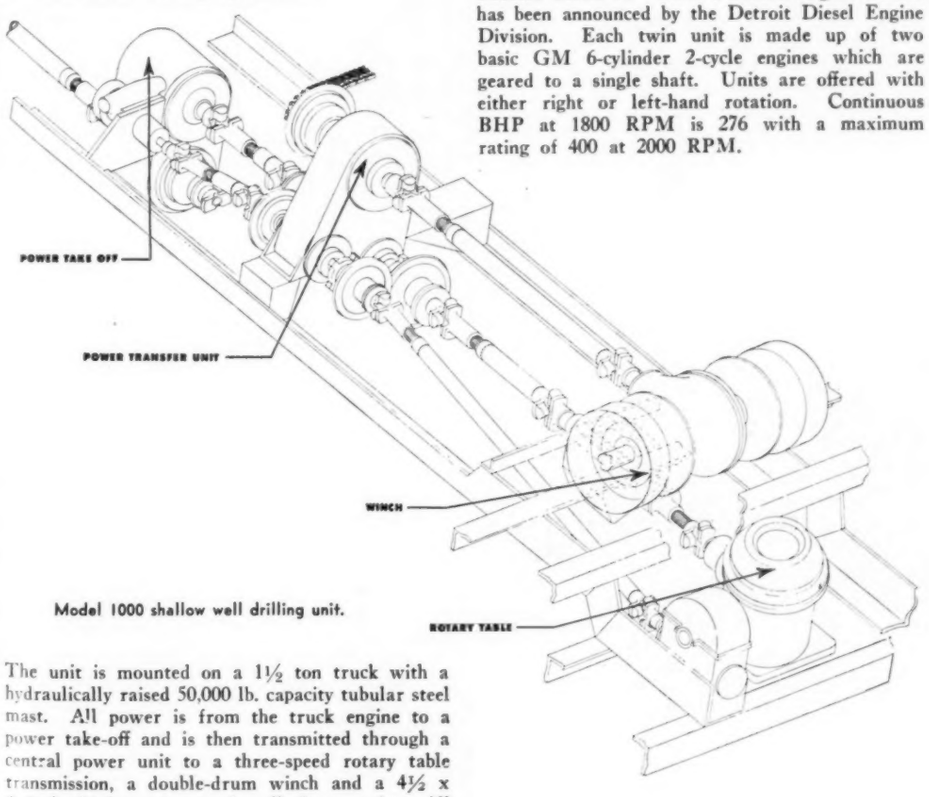
OMSCO Safety Valve

A UNIQUE design safety valve which is actuated by the velocity of line fluids on its cone-shaped valve stem is offered by Oilfield Machine and Supply Co. It is designed to provide a surface installed, simple and inexpensive means of shutting in wells, flowlines or pipe lines in the event a break occurs in the flow system.

The valve is set by means of one screw adjustment to pass fluids at a certain desired velocity. If the pressure drop across the valve increases, the increase in rate of flow or increased velocity past the cone valve stem will pull the stem into the seat, thereby shutting in the well. Sensitivity of the valve is adjustable. Reopening must be done manually to insure that flow will not start again until desired.

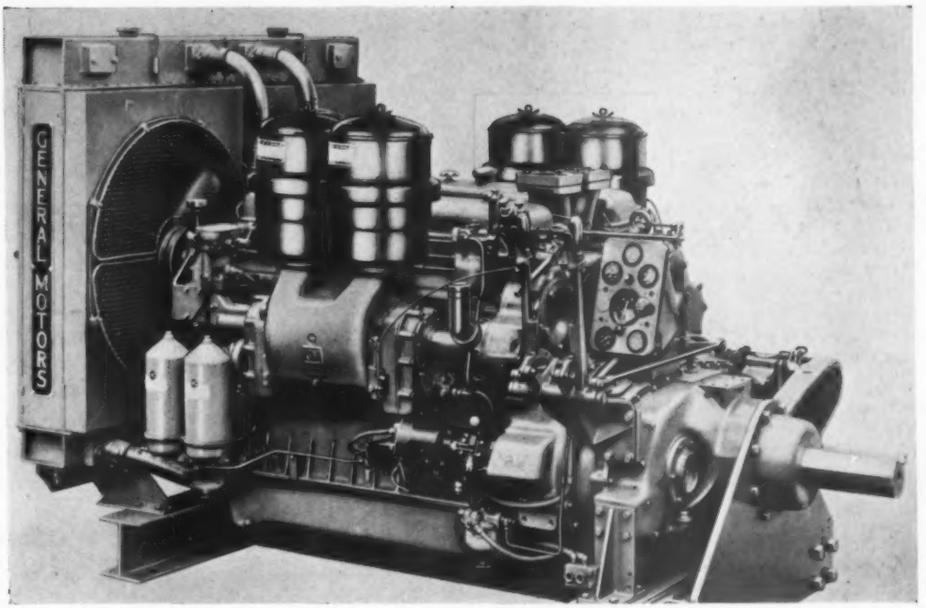
Portable Drilling Unit

WESTERN GEOPHYSICAL CO. announces production of a self-lubricated, completely sealed portable drilling unit. Of particular interest is the fact that no lubrication is ever necessary on any functional part of the unit with the exception of one zerk on the pull down shaft and one zerk for swivel packing. Developed for their own use in exploration work, the model "1000" is now available for drilling shot holes, shallow oil and gas wells, water wells, disposal wells and other drilling operations.



Model 1000 shallow well drilling unit.

The unit is mounted on a 1½ ton truck with a hydraulically raised 50,000 lb. capacity tubular steel mast. All power is from the truck engine to a power take-off and is then transmitted through a central power unit to a three-speed rotary table transmission, a double-drum winch and a 4½ x 6 inch duplex pump and pull down unit. All parts are designed so that engine will stall before any part will break. Every functional part of the unit including swivel bearings feature dust-proof sealed oil bath lubrication and require no maintenance regardless of operating conditions. The rig is particularly recommended for hot, dusty corrosive areas where lubrication may present a problem. The model "100" is rated at 1000 feet with a 3 x 3 inch square kelly 14 feet long, handling 2⅜ inch drill pipe and 6½ inch bit. Holes up to 1500 feet have been drilled.



New Diesels

PRODUCTION of new and improved General Motors Series 71 "Twin 6" diesel engine models has been announced by the Detroit Diesel Engine Division. Each twin unit is made up of two basic GM 6-cylinder 2-cycle engines which are geared to a single shaft. Units are offered with either right or left-hand rotation. Continuous BHP at 1800 RPM is 276 with a maximum rating of 400 at 2000 RPM.

An outstanding feature of the new models is in the variety of available power take-off arrangements. Any one of four different transfer gear types can be selected. Various gear ratios are available with an increase of 25 percent in the shock load capacity. The engine base has been provided with stronger "I" beam supports to facilitate removal of one or both of the engines. Throttle controls have improved bearing areas and are of more rugged construction. With the new Twin models, dual electric starting motors as well as gasoline starting equipment are obtainable as optional selections for the first time.

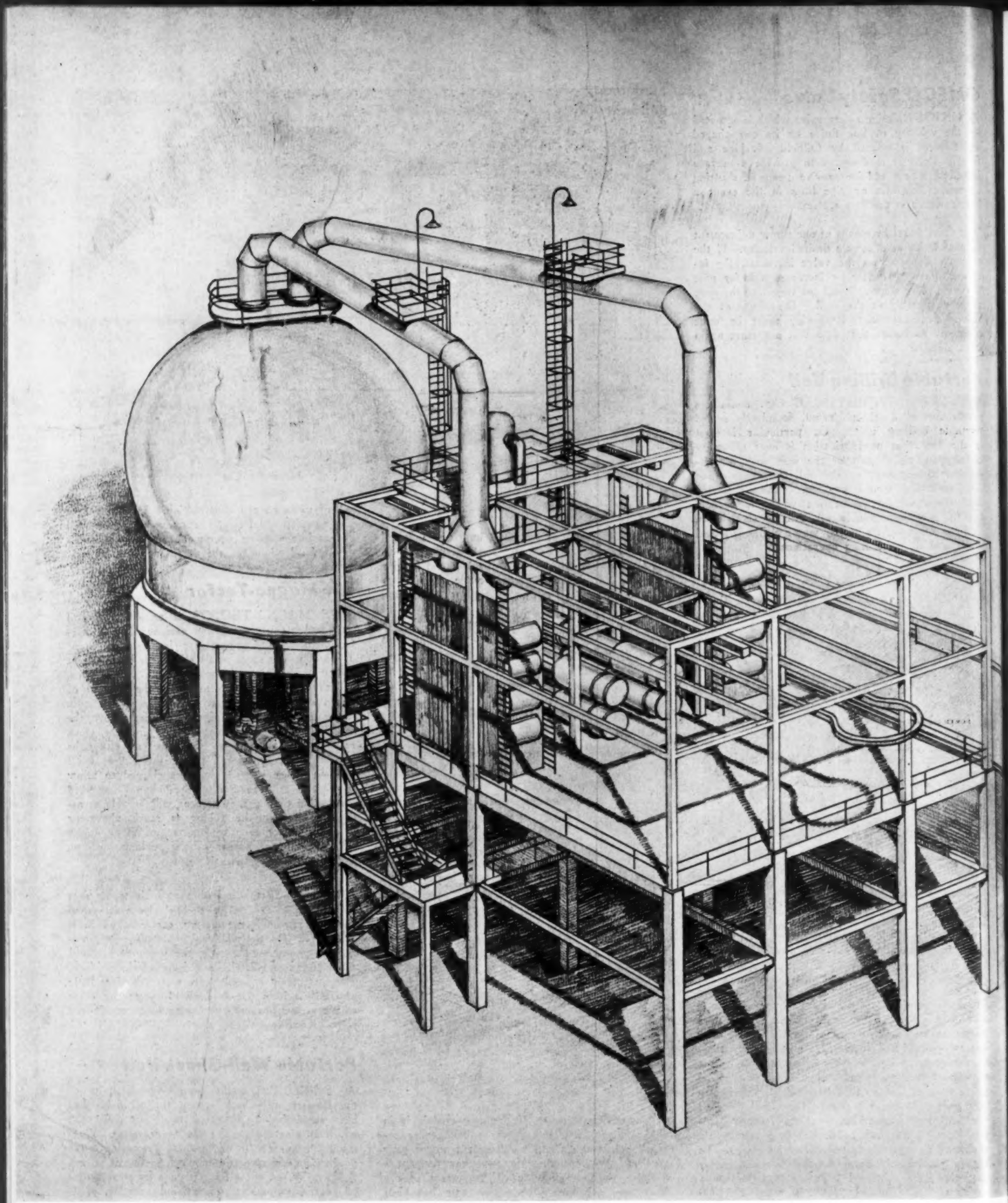
The Magna-Tector

THE MAGNA-TECTOR is an electronic oil well tool manufactured and designed by the McCullough Tool Company for locating the point at which pipe is stuck in a well, or the lowest point that it is free, and from where it can be recovered. It can also be used to ascertain the amount of strain or compression at any given point in a string of casing, drill pipe, or tubing above the stuck point. When used in drill pipe, the stuck point can be located so the pipe can either be cut off, shot, or backed off at the lowest point possible before enough time has elapsed to allow the pipe to stick farther up the hole. When used for testing tubing, the operator will be able to ascertain whether the tubing is stuck above or below a packer or a tubing hanger. The device will indicate the nature of the sticking medium, as well as the location.

The Magna-Tector embodies two electromagnets which anchor the device to the pipe wall when energized through the electric cable on which it is lowered into the well. When tension is subsequently placed on the pipe, the instrument shows the amount of stretch on a gage at the surface. The instrument is sensitive to a stretch of as little as 0.001 inch in five feet. By locating the point where stretch begins the instrument reveals the point of sticking.

Portable Well-Check Unit

A PORTABLE outfit combining all units of the Bowser well-check system for oil fields has been announced by Bowser, Inc. The new unit, which is marketed under the trade name "Portachek," is for use in oil fields to determine crude production quantity and quality, G/O ratios and B. S. & W. of oil wells. It consists of a special oil meter, automatic proportional sampler, spill-proof gas trap with peel-off valve, manifold for returning fluid and gas to the production line during testing period, and a trailer chassis.



Spherical flash tower with an inside diameter of 30 feet which will operate at 1.16 psia or 60 milli-meters pressure taking overhead 80 percent of 35,000 barrels of crude daily. Unit will be built by Shell Oil Co.

TRENDS IN REFINERY EQUIPMENT

by EGON F. BRUMMERSTEDT*
JOHN A. JOST
CHARLES BLISS

THE synthesis of gasoline by the Fischer-Tropsch process or related methods for production of gasoline from coal is resulting in plants with constantly larger and heavier pieces of petroleum processing equipment, particularly vessels. Up to now fractionating towers thirty feet in diameter and up have been built, but operating at comparatively low pressures, either atmospheric or vacuum. In fluid catalytic cracking units, regenerators up to about 50 feet in diameter have been and are still being constructed, operating at only a few pounds per square inch pressure and protected from high temperatures by refractory insulation; hence their wall thicknesses did not usually exceed one inch. Reactors for the same units have been about 30 feet in diameter and operating at fairly high temperatures (up to 1000°F); hence their wall thickness have been close to two inches. The latter were stress-relieved during initial operation of the units.

The construction of these vessels naturally required considerable fabrication and welding on the site. In order to keep welding difficulties to a minimum, only mild carbon steel was used in these vessels, although a few of them had corrosion resistant alloy liners. Difficulties resulted in welding a conical head to a cylindrical shell on reactors and regenerators. As a result the trend in large vessels with conical heads has been toward inclusion of a knuckle radius (torus) between cylinder and cone junction. This has resulted in a better and simpler welded joint and also reduced discontinuity stresses at that point. Alternately, the use of built-up hemispheroidal heads for these vessels is becoming more frequent. The technique of fabricating these heads had been developed in connection with the construction of spherical pressure storage tanks.

In coal hydrogenation processes, tremendous pressures (up to 1000 atmospheres) had resulted in vessels of comparatively small diameter, i.e., up to about four feet, having wall thicknesses of six to eight inches. They obviously had to be made as integral forgings, at a high cost.

Now the petroleum refining industry is looking forward to coal gasification and conversion plants that will require an unusually large number of vessels, some approximately 20 feet in diameter, operating at high pressures and high temperatures.

These large vessels must necessarily be assembled at the site, since they are too large to be shipped in one piece. High-tensile steel (A-212 grade B) with a minimum tensile strength of 70,000 psi may be used in many for economy and to keep the thickness down to reasonable limits for field welding. The use of this steel is indicated for economic reasons when the thicknesses using ordinary A-70 carbon steel exceed two inches, and several of these vessels will be over three inches thick. Stress-relieving and radiographing is automatically mandatory for this steel if the thickness exceeds one inch, in accordance with the API-ASME code for unfired pressure vessels. In addition to that, special techniques and precautions, including preheating to about 250°F, have to be employed when welding this type of steel.

All these considerations, plus the large number of these vessels, lead to the conclusion that a pressure vessel fabrication shop must be set up on the site of the proposed refinery. No rolls, presses or milling machines are contemplated since the work of those machines would be done at a regular shop before the vessel plates were shipped to the site, already rolled and with edges machined for welding. Equipment and facilities for automatic welding, preheating, radiographing, testing and stress-relieving must be furnished at the construction site, however, as well as equipment for handling such heavy pieces.

Stress-relieving of such large vessels could not be done in a furnace since the cost of building the latter would be prohibitive. Hence it will be necessary to use portable stress-relieving units consisting of a small furnace, a recirculating air fan driven by a 50 hp motor, a reversing damper and a 30-inch diameter No. 10 Ga. metal ductwork, lined with heat-resistant concrete. The ductwork will be connected to two open manholes on opposite ends of the vessel, after the latter has been raised into position and covered with insulating material. Air heated by the furnace to about 1200°F. will be circulated through the vessel, and the temperature of the steel shell recorded by thermocouples attached at various points to the vessel.

Excess hot air will be allowed to escape through perforated disks placed over some of the nozzles or remaining manholes. By attaining a metal temperature of at least 950°F, which is not difficult with this method, the duration of the heating period need not exceed five hours per inch of thickness (API-ASME code) or about 15-20 hours for the thicker vessels.

Radiographing and testing of the vessels is naturally done in the field shop prior to erection and application of insulation for the stress-relieving operation. Heavy lifting lugs will be welded to the vessels to permit one-piece erection by strengthened derricks capable of lifting 275 tons.

The successful completion of such a plant will mark another important step in the progressive development of the petroleum industry in general and the construction of large pressure vessels in particular.

Direct-Fired Heaters

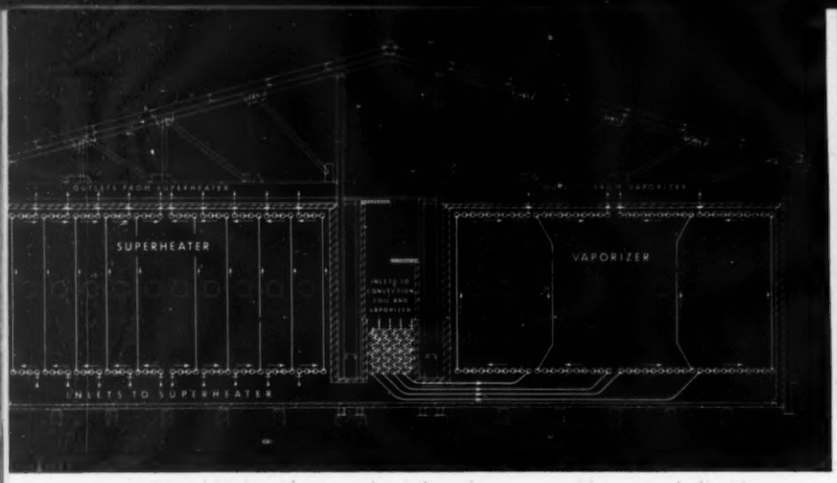
Recently there have been trends in fired heater design resulting from the advances in petroleum technology that have altered relationships of some petroleum fractions formerly considered as plant fuel, to other products of the refinery. For example, the tendency to greater proportion of oil fuel firing in relation to gas fuel has increased steadily because of the diversion of gas production, formerly sent to the plant fuel system, to chemical plants and other uses. These gases have become the starting materials for synthetic gasoline, aviation gasoline and chemicals. Oil fuel, as a result, has come to the fore.

However, because of the continuing demand for fuel oil, the quality of such oil available for use in the refinery has been kept low. Such fuel oil is usually of high ash and sediment content and low gravity. Fired heater designs for use of such oil have incorporated features designed to allow trouble-free operation.

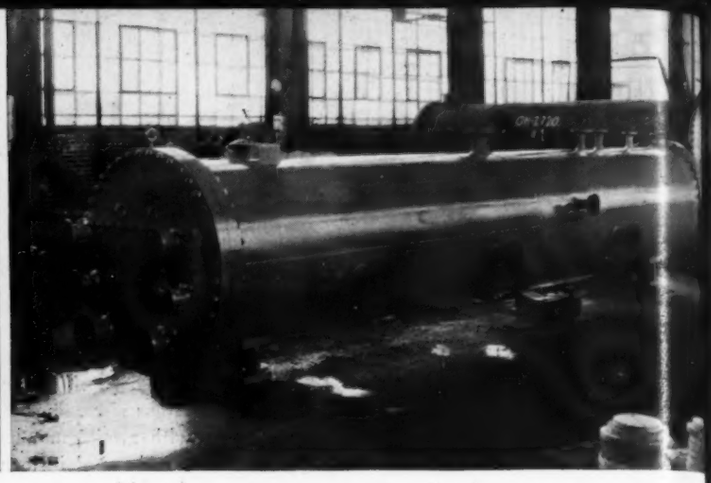
Because of rising fuel costs, more consideration has been given to installing heat recovery equipment to serve fired heater installations. Previously heat recovery equipment was usually limited to fired heaters wherein the convection section inlet temperatures were very high, thereby making normal thermal efficiencies uneconomical, but recently air heater designs have begun to appear for fired heaters serving two-stage crude distillation units.

Air heater designs have been developed which (a) eliminate the necessity of by-passing to take the air heater out of service during forced draft fan failures; (b) permit the use of high ash content fuel without fouling heat transfer surface, and (c) allow control of the air heater tube metal temperatures where the installation is subject to wide variations in heat load and where high sulfur content fuel oils are used. High sulfur fuel oils, because of the solubility of the sulfur dioxide in condensed water vapor, result in stack gases having higher dew points than would

* Foster-Wheeler Corp.



Two "downdraft" heaters of this type are vaporizing and superheating the charge of two large cat crackers. Heat absorption rate is 100 million Btu per hour. A heater of this type with a capacity of 180 million Btu per hour is being designed.



Multihead heat exchanger producing process steam from three separate hot oil streams.

be predicted from the water vapor content alone. Such stack gases may cause undue sulfurous acid air heater tube corrosion with flue gas temperatures as high as 400°F.

Where additional steam is required and treated feed water is available, consideration is being given more frequently to the use of waste heat for either forced or natural circulation steam generators. Oftentimes, depending on economic conditions, a waste heat steam generating system may be installed for the same, or lower, investment cost for optimum overall thermal efficiency than air heaters,

The tendency to fire with larger numbers of smaller burners, particularly in the case of fuel oil, has resulted in greater flexibility in surface arrangements with respect to burner spacing and location so that heat is liberated more uniformly from the fuel fired is throughout the combustion chamber, thereby minimizing variations in radiant section heat transfer rates from the mean value. The use of a large number of small burners enables multiple coils to be installed in radiant sections with some control over heat absorbed by each coil. Recent installations have been made with ten parallel coils in a single radiant section with satisfactory control of heat absorption to each coil.

Improvements have been made in the mechanical construction of fired heaters. Notable is the wider use of the light-weight insulating firebrick type of setting with its resulting decrease in the interval required for starting up and shutting down and the savings in investment due to the lighter weight to be supported by the steel structure. Increased use has been given to the high chrome—no nickel and high chrome—high nickel alloy steels for high temperature, low pressure thermal cracking as practiced for ethylene production. The use of these materials has caused development of new methods in fabricating heater coils to withstand operating conditions usually not encountered.

Several new type and improved heat exchangers have been announced to the industry recently. One is the new multi-head exchanger which is of particular interest to oil refiners who may have several small hot streams that cannot be effectively used for an important heat transfer service. Individually these streams may be performing a creditable service, but together, as by team work, they can be made to do an outstanding job. One refiner is cited using this type unit to generate steam at 165 psi gage, using three hot streams of oil of varying quantity and inlet temperatures. Alternately, the heating medium is one stream of hot tar. Another is preheating a large crude stream with four small hot streams.

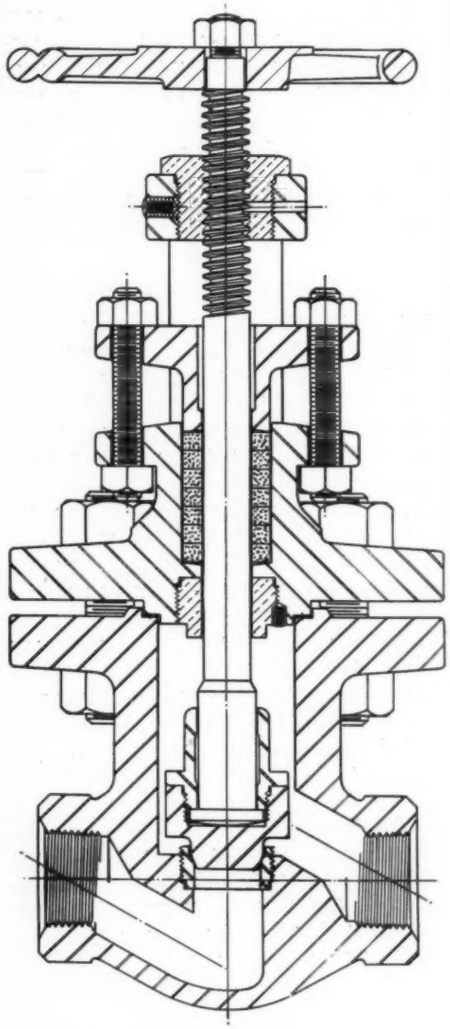
The multi-head unit is made up of the conventional shell with clusters of tube bundle nests inside. These nests may completely fill the shell or only a portion of it, as in the case when generating steam. Shell baffling is similar to any other shell and tube unit. Where crossing of temperatures is severe or where preheating of a feed is necessary before vaporizing, the multihead unit is very adaptable for the use of longitudinal shell baffles.

Each tube nest consists of four two-inch OD x 11 BWG tubes of any length. One end of each nest has a common floating head 6½ inches OD, while the other end of the nest is rolled into stationary tube sheet common for this end of all nests. The stationary head is a flat plate with hogged-out returns. Unlimited flow patterns in series or parallel can be laid out, depending upon the number and volume of hot streams available.

The floating heads of the nests rest one upon the other and are free to expand and contract independently. The usual gasket or tube roll leaks in conventional designs caused by differential expansion strains are eliminated by the use of the individual small floating heads. Removal of the floating heads is a simple matter, as is the cleaning of the large diameter tubes.

Drop Forged Steel Valve

THIS valve is recommended by Henry Vogt Machine Co. for steam, water, oil or gas service and is offered in globe and gate types from one half to four inch sizes, for 600 lb. service, with screw or flanged ends. Features, in addition to the short compacted bonnet, include: inserted back seat bushing of bronze or alloy steel as required, and a loose disc nut having a long bearing for true alignment with stem. Globe valves have screwed-in seats, while gate valve seats are rolled-in. Trim is stainless, monel or nitralloy or stellite faced to suit the service. The globe valve shown on the accompanying illustration is designed for steam service.



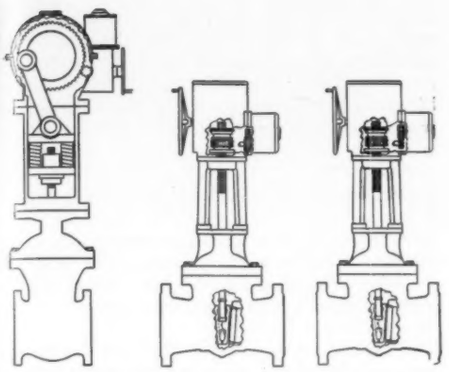
Vogt steam valve.

Evolution of a Valve Specification

ACCORDING to a bulletin of the M. W. Kellogg Company (The Kelloggram, 1947, No. 2), one broad subdivision of specification writing required of petroleum refinery engineers is the detailing of completely new equipment for which no

previous standards exist. This is illustrated by the evolution of a motor-operated valve for refinery use, as illustrated by the three accompanying diagrams.

The first motor-operated valves (first stage) employed a set of gears to turn a threaded valve stem. Time of closing was 60 seconds, and the closing action created undesirable impact when seating.



However, hydroforming required faster moving valves (second stage). Larger gear ratios and a thread of increased pitch reduced closing time to 30 seconds; but even this was not fast enough.

Joint study with valve and gear engineers evolved today's crank mechanism (third stage). Half a revolution of the crank closes the valve, without shock, in five seconds.

Filtrol Fractionation Process

FILTROL fractionation is the name of the process in which Filtrol, the highly activated adsorbent made by Filtrol Corporation, is injected into a hydrocarbon oil stream as it flows to fractional distillation equipment. The purpose of this relatively new technique is to combine fractional distillation and continuous filtration into a single and more economical process. The process is applicable to the refining of solvent treated stocks, long residuals, low asphaltic or treated lube crudes, and dewaxed cylinder stock solutions. By combining distillation and decolorization, substantial savings in equipment, upkeep, maintenance and operating costs are effected.

Herewith is a flow diagram of a Filtrol Fractionation plant. As indicated in the flow sheet, a portion of the charge to the pipe heater is continuously by-passed through a small mix tank. This tank is equipped with a mechanical agitator which mixes the Filtrol with the oil, thus forming a readily pumped oil adsorbent slurry. The Filtrol is automatically fed to this tank by a gravimetric feeder insuring accurate control of the adsorbent feed at all times. The feeder is supplied with Filtrol by a scroll-type conveyor from the overhead storage bin. The by-passed oil containing the Filtrol rejoins the main flow of the charge and continues through the heat exchangers before entering the pipe heater. The temperature of the heater outlet is instrument controlled. The hot oil adsorbent-slurry then enters the vaporizer section of the vacuum fractionating column where the unvaporized portion which contains all the Filtrol passes over a number of stripping trays before falling into the soaking section. The lighter cuts thus receive an adsorbent treatment in passing through the exchangers and furnace, after which the adsorbent charge is concentrated in the bottoms which require heavier treatment. The vaporized material is fractionated into the desired cuts, each of which passes through a steam stripper which eliminates all undesirable odor and insures color stable products.

The bottoms and Filtrol in the soaking section of the tower are agitated and stripped by the injection of steam into the bottom of the vessel. The soaking time or contact time is regulated by controlling the liquid level in this section. The slurry then passes through the bottom exchangers and into an insulated surge tank from which a continuous vacuum rotary filter is fed. The spent adsorbent is filtered from the oil which passes through a cooler to finished oil storage. The spent cake is continuously removed by a screw conveyor.

In certain instances, the Filtrol Fractionation process has definite benefits over contact filtration finishing. The refiner's position—process—and market-wise, must be carefully analyzed to determine the extent of these advantages for each specific use.

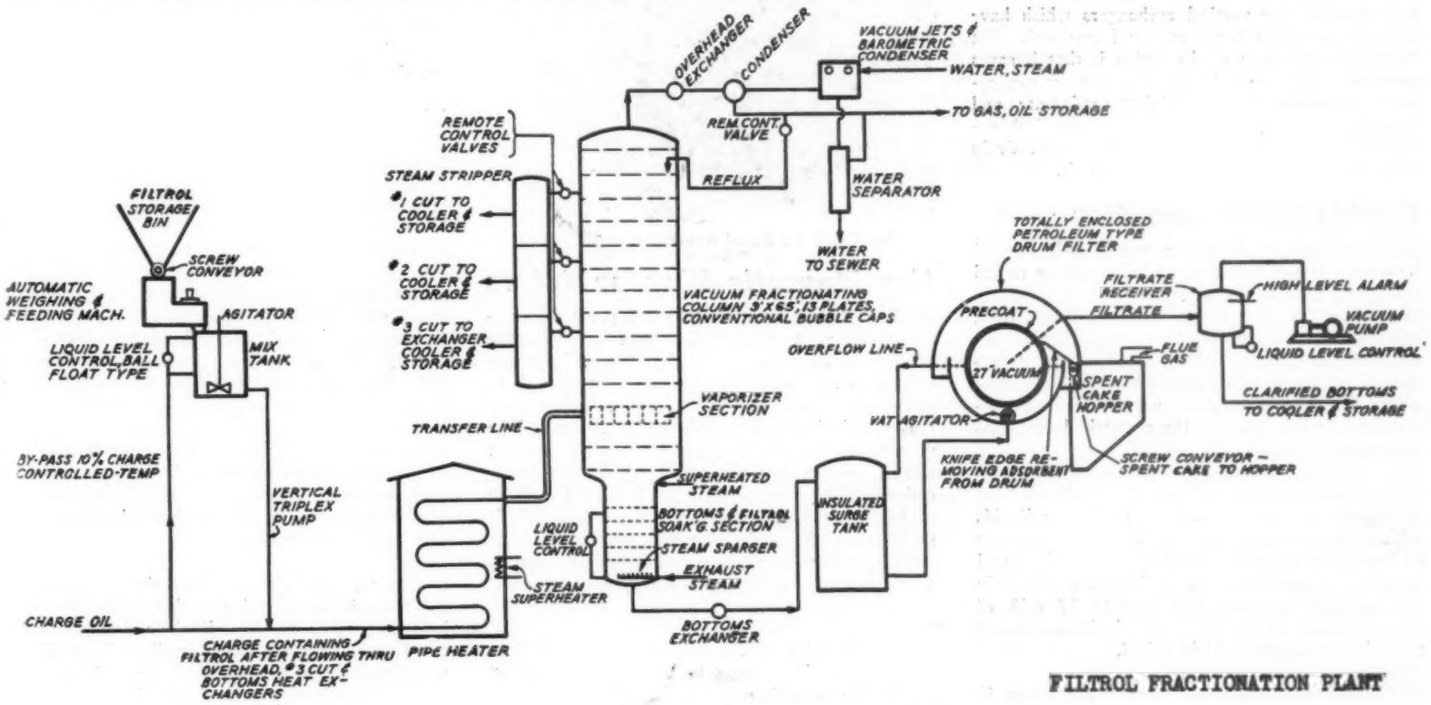
New Type Compressor

ASSOCIATED ENGINEERS, INC., Las Vegas, Nevada, have tested a model of a new oscillating compressor which is said to be of revolutionary design. The new oscillating compressor has only four major driving parts. Each cylinder is divided into four compartments by means of two stationary vanes. There is one oscillating rotor fixed to the rotor shaft. At every revolution of the crankshaft, eight power outputs are produced, the equivalent of the displacement of both cylinders.

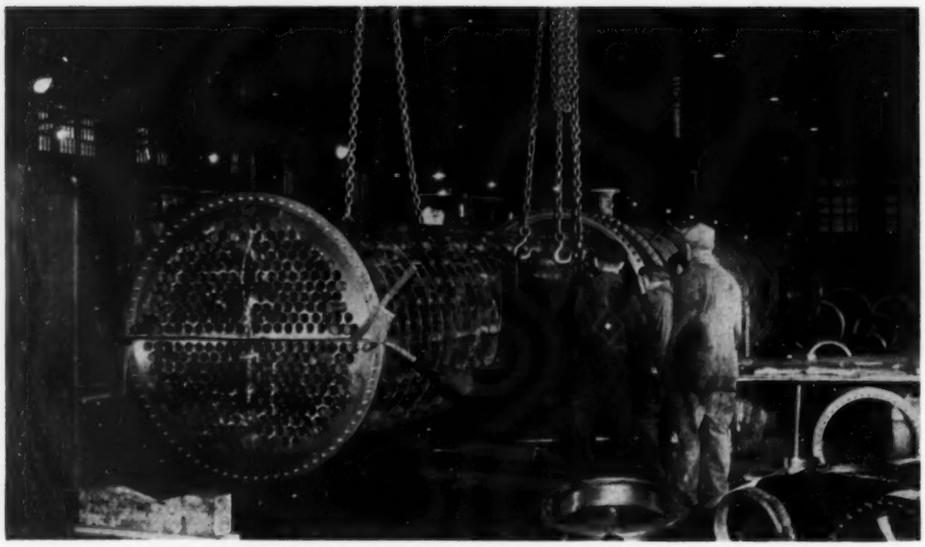
It is said that the output of this compressor is about ten times that of a comparable size conventional compressor. It is the plan of Associated Engineers, Inc. to have the compressor manufactured on a licensed basis.

Helicoidal Gage

THE Helicoid gage of the American Chain and Cable Co. was designed to replace the ordinary gage movement with spur gear teeth, and is intended for use wherever a gage is subjected to violent pressure pulsations, or severe mechanical vibrations. It has no teeth to wear out or to become fouled. Since the cam can be made to contact the roller groove at any desired point or at any time during the pressure cycle, an abbreviated scale gage is easily made with a Helicoid movement which has not been possible heretofore. A gage with a total dial graduation from 100 to 200 psi over the total dial arc, for instance, is made simply by having the cam contact the roller groove exactly when the pressure in the gage system is 100 psi. The pointer starts to move from the normal zero position on the dial only when the pressure reaches 100 psi. These are some of the advantages possible only with the Helicoid movement.



FILTROL FRACTIONATION PLANT



Alco heat exchanger uses lighter metals.

Tubular Heat Exchanger

THE American Locomotive Co. has announced that, at the instance of some oil refineries and power plants, it has developed significant improvements in tubular heat exchangers. One of these is a patented design for effectively cooling the tube sheet which is exposed to extremely high temperatures. Under this method, the hydrostatic and pressure loads are moved from the tube sheet to the outside edge of the exchanger. A primary advantage is that lighter metals can be used in new exchangers, eliminating stresses which sometimes were set up in thick tube sheets. Alco already has built two exchangers featuring the new design. Both were for the Atlantic Refining Company, one for installation at Atreco, Texas, and the other at Philadelphia.

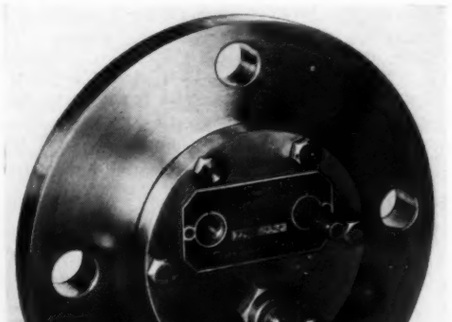
The second improvement covers a new application of Alco's feed water heater vent section. It features an integral hot well, or condensate collection chamber, for vertical exchangers which have channels or water boxes at the lower end. An important advantage of the design is that it saves space as well as simplifying the former cumbersome arrangement for draining condensate and exhausting non-condensable gases in vertical exchangers. The liquid level regulator and drain valve are mounted directly on the unit.

Liquid Level Transmitter

THE problem of having a conveniently located instrument which will accurately indicate or record the level of liquid in a remotely located tank is now solved by the new, simple, highly sensitive, non-clogging and corrosion resistant Taylor Instrument Companies' 229RF liquid level transmitter. A single compact unit measures the level of the liquid and transmits an air pressure proportional to this level to the remotely located instrument.

This transmitter is particularly applicable for measuring the level of viscous liquids or liquids with solids in suspension; the level measurement of liquids or solutions which solidify in the usual pressure or manometer connections; and relatively low pressure measurements (up to 17 psi) of corrosive gases or liquids for which the diaphragm type element is particularly suited.

The single unit consists of a metal diaphragm in a three-inch 150 psi stainless steel flange which can be attached to the bottom or the side of an open or vented tank. This transmitter operates on the force-balance principle. Being a one to one transmitter, the output air pressure is equal to the applied pressure or liquid head and has a range of 450 inches of water with an accuracy of plus or minus one inch of water. Bulletin 98069 illustrates and gives complete and detailed information regarding the new transmitter.



Transmitter for distant reporting of liquid levels.

New Magnetic Alloy for Motors

A NEW 35 percent cobalt—64 percent iron—one percent chromium alloy that carries more magnetism than any other alloy practical for use in motors and generators and is tough enough to withstand intense vibration has been developed by the Westinghouse Research Laboratories. The new alloy, "Hiperco" will make possible compact electric motors and generators which will be an estimated 10 percent smaller and lighter than those of equal power now built for aircraft. This is so because the high magnetic saturation point of Hiperco will permit the design of motors with less metal for the same power, or more power from the same amount of metal.

The combination of 35 percent cobalt with iron gives the highest magnetic saturation point of any known metallic material, and the one percent chromium is added to make the alloy workable. The new alloy is the result of 20 years' research with the final difficulty of brittleness being overcome only recently. Earlier samples of Hiperco were too brittle to be of great use. However, a method of rolling was devised which enables production of a tissue-thin strip of metal tough enough to withstand intense vibration and yet ductile enough to be bent double without breaking.

Formerly the metal was hot-rolled and allowed to cool slowly, but unlike ordinary iron and steel, cobalt-iron becomes brittle when it cools in this manner. It has been found that brittleness can be avoided either by quenching the alloy in cool water or by continuous rolling, while the hot metal cools.

Now, with the quenching method in use, Hiperco ingots are rolled into slabs two to three inches thick, reheated to a high temperature and rolled again to a thickness of one-tenth of an inch. As the strip emerges from the last set of rolls, it plunges into a trough of cooling water.

The sudden cooling makes the metal so strong and workable it can be coiled like wire, whereas formerly it could not be bent at all. The cool metal then goes through a cold rolling process which can further reduce its thickness to as little as one two-thousandths of an inch. For most motor and generator applications, however, thickness of approximately one two-hundredth of an inch is sufficiently thin.

Even though cobalt is a high cost material, most of which must be imported from Africa, Hiperco will be of value wherever smaller and lighter motors and generators are economically important. Minerologists are now searching for new supplies of cobalt in the United States, Canada and China. If they should find a sufficient supply, Hiperco might replace other metals in many types of motors and generators. Today, however, its cost limits its use to such applications as aircraft where savings in weight and size are important from an operating cost standpoint.

New Fractionating Tray

THE Koch Engineering Co., Inc., announces what is described as the first major advance in fractionating technique in 30 years.

The principle of this new invention is shown i the accompanying diagram which illustrates a vertical section and design for a tray four feet in diameter. Liquid entering through a downpour from the tray above is fed into one of the parallel vapor streams rising from the tray below, and the resulting mixture is hurled against a solid plate to which is attached a perforated baffle. The velocity of the mixture creates considerable centrifugal force as the mixture flows along the baffle, forcing all of the liquid and much of the vapor through the perforations. The liquid separates from the vapor on the other face of the baffle to feed into the next trough where the operation is repeated. Intense and repeated contact of vapor and liquid is secured and there is no short circuiting of either vapor or liquid. Due to the stair-step arrangement of troughs, large quantities of liquid can be handled with no build-up from one trough to the next.

As regards the difference from the ordinary bubble tray, it is pointed out that with the latter it is impossible to flow liquid uniformly across the flat plate since a liquid gradient is established to overcome the resistances in the path of liquid flow. This variation in liquid head results in

vapor flowing through only a portion of the bubble caps on the outlet side and liquid flowing down the risers on the inlet side. As the load increases, the liquid gradient and pressure drop increases until the pressure drop exceeds the available liquid head in the downpour and the tower floods or "pukes."

In the bubble tray the force of gravity is relied upon to secure separation of the liquid and the vapor bubbling through it. In the Kaskade tray an entirely different principle is utilized, i.e., the mechanical separation of the admixed vapor and liquid by centrifugal force.

The manufacturers say that these trays are not an untried venture but have been used during a period of over three years in crude distillation, cracking plant towers, absorbers, recovery and stabilization units, debutanizers and deisobutanizers, extremely close cut naphtha fractionators, etc. The Kaskade trays are said to be particularly useful in difficult fractionation services and for high pressure operation where the vessel cost is high. In one case it is said a Kaskade tower handled 36 percent greater load per sq. ft. of area and effected the same recovery with 80 percent as many trays as required with bubble trays.

The Vaporsphere

THE Vaporsphere, built by the Chicago Bridge and Iron Co., is a new and improved device which temporarily stores displaced vapor to reduce breathing losses. It may also be used to reduce filling losses from tanks operating at relative low pressures by designing it to operate at the same pressure as the tanks and equipping the air space with a pressure regulator.

The Vaporsphere consists primarily of a spherical steel shell and a flexible hemispherical membrane made of a tough fabric coated with oil-resistant synthetic rubber. The outer edge of the membrane is connected to the inside of the shell at the equator. Vapor is stored under the membrane, and the space above the membrane is filled with air at all times.

The Vaporsphere is connected to the vapor spaces of one or more gas-tight tanks by light-weight, large-diameter piping. Vapor displaced by filling or forced out of the tanks by breathing due to increasing temperature flows through the vapor lines into the Vaporsphere. These vapors are stored temporarily and flow back into the tanks when the conditions causing their displacement are reversed. The inter-connecting piping in a Vaporsphere system also allows vapor to flow from one tank to another when some tanks in the system are being filled and others are emptied at the same time. This balancing action reduces vapor losses which occur when individual tanks are filled, without materially increasing the amount of vapor flowing into the Vaporsphere.

When the Vaporsphere is empty the flexible membrane rests against the lower half of the shell. The entire volume of the sphere above the membrane is filled with air. When vapor is displaced from the tanks by breathing or unbalanced filling, it flows into the space in the Vaporsphere between the membrane and the lower half of the shell. This causes the flexible membrane to billow upward to accommodate the income volume. Simultaneously, an equal volume of air above the membrane is discharged through an open vent at the top of the shell. The operation just described is reversed when contraction due to lower temperatures or the withdrawal of liquid from one or more tanks in the system cause vapor to flow back into the tanks.

The manner in which the Vaporsphere operates completely eliminates the placing of any strain on the flexible membrane or diaphragm. At all stages of filling and emptying, the membrane rides on and is supported by the vapor beneath it. When completely filled, the flexible membrane comes in contact with the top half of the Vaporsphere. The steel shell backs up the membrane and keeps it from being overstressed or damaged by pressure. Likewise, the membrane rests against the lower half of the shell when the Vaporsphere is empty and, again, the shell backs up the fabric and eliminates any possibility of vacuum damage.

The steel shell of the Vaporsphere is safeguarded from damage by a pressure and vacuum relief valve in the vapor line which vents to the atmosphere any additional vapor forming in the system after the Vaporsphere is full and admits air into the system when condensation due to lower temperatures causes further contraction of the vapor, or liquid is withdrawn from one or more tanks in the system after the Vaporsphere is empty.

In addition to the pressure and vacuum vent on the main vapor line near the Vaporsphere, each tank is equipped with a pressure and vacuum vent capable of protecting that tank alone. The pressure and vacuum settings of this vent need be only high enough to build up the pressure head necessary to sustain flow through the vapor lines. The pressure and vacuum is always in the normal range for the tank involved so that it is never necessary to increase the design or reinforce a standard tank. The interconnection of several tanks and the Vaporsphere, each vented separately, has the advantage of providing added safety in the event of failure of any one vent to function or in case some unusual condition causes the capacity of any one vent to be exceeded. For instance, a cold rain falling on a group of tanks toward the end of a hot day will cause an abnormally rapid contraction of the vapor in them for a very short period of time.

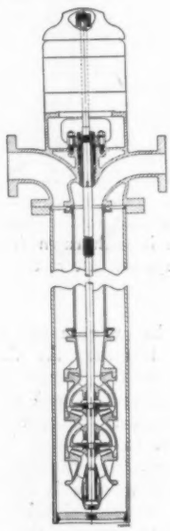
The amount of venting in a vapor saving system depends on the capacity of the Vaporsphere in it. Normally, the Vaporsphere should have sufficient capacity to prevent all venting under average operating conditions. Ordinarily it is not practical to build a Vaporsphere with sufficient capacity to hold all of the vapor displaced from a group of tanks under unusual temperature conditions or by unbalanced filling. The amount of savings—or loss—does not justify the cost of the extra capacity which may be utilized only a few times a year.

Refinery Pump

ENGINEERS of the Cameron pump division of Ingersoll-Rand Co. have developed a complete line of vertical turbine-pumps for use in refineries. These pumps, when equipped with open impellers, are designated as class APHR and, when equipped with closed impellers, as class APKR. They are designed for applications where low submergence is required and are particularly suitable for services where it is difficult or expensive to obtain sufficient suction head with a conventional horizontal pump. They are also ideal for use in places where floor space is limited.

APHR and APKR pumps are built in discharge sizes from six-inch to 14-inch for capacities up to 5,000 gallons per minute. They are made in one, two, three or more stages to develop the necessary discharge head. Up to 90 ft. per head can be developed per stage. The pumps will handle all usual refinery liquids at temperatures up to 800°F. They are self-venting and have only one stuffing box. The stuffing box can be of the packed type or can be equipped with the Cameron shaft-seal. The general construction is as follows:

Casing consists of two sections; the lower part has a bell mouth intake opening and incorporates a bottom bearing. The upper part encases the impeller and has guide vanes which direct the flow of liquid from the impeller into the column or into the second-stage impeller.



Impeller is of the mixed-flow type having a non-overloading characteristic and is keyed and locked up to the shaft. The locking device consists of a split collar which fits into a groove in the shaft and is bolted to the impeller. Impeller mounting permits individual impeller adjustment and positive locking in axial position on the shaft.

Shaft is of high-quality stainless steel, normally made in one piece. However, for long column length a coupled shaft may be used. The thrust load is carried by the driver thrust bearing. Consequently, the only bearings necessary are those provided to guide the shaft. These consist of sleeves of suitable material mounted in the pump bowls and lubricated by the liquid being pumped.

A column or drop pipe connects the pump casing with the discharge head and is of a length to suit the installation requirements. It is suspended at its upper end from the nozzle head which incorporates a base plate for mounting on the floor and also supports the driver. The column or drop pipe is normally made of standard welded steel pipe, but may be of bronze or other suitable material if required.

Nozzle head is of high quality casting of material required by the service. It contains flanged suction and discharge nozzles, incorporates a base plate for mounting the pump, and supports the driver. The nozzle head also includes an extra-deep water-cooled refinery type stuffing box.

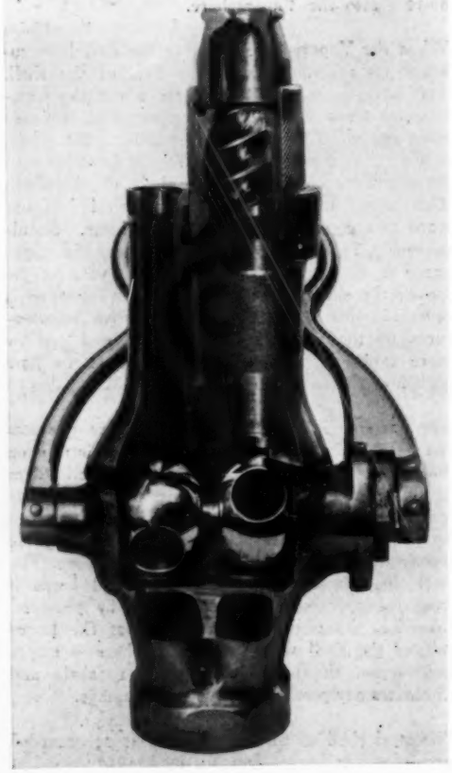
Stuffing box is extra deep. It may be packed solid or may be arranged for circulation, bleed-off or injection. The gland is of the split type which can be entirely removed from the shaft for easy access to the stuffing box. The stuffing box may be equipped with the Cameron shaft-seal, if desired at extra cost. This seal eliminates packing and is ideal for most refinery liquids.

Shell consists of steel pipe or other materials required by the service. It is connected to the nozzle head and completely surrounds the pumping unit, serving as a suction pump.

Emulsion-Forming Spray Nozzle

THE extension of the emulsion-extinguishing oil fire fighting technique to portable 1½ in. hose lines has been recently announced by Grinnell Corp., marking the entry of this nearly-a-century old company into the field of portable, oil-fire fighting equipment.

Emulsion extinguishment uses dispersed water in droplet form, driven fast enough to penetrate the flame zone above oil fires and create an emulsion with water and oil at and near the surface of the burning oil. Such emulsions cause instant extinguishment and leave a film of emulsion over the surface of the oil which provides after-protection against re-ignition from hot metal, open flame or other sources. The time this after-protection persists varies with the characteristics of the oil involved, lasting for fractions of an hour in the case of heavy oils, for minutes in the case of medium oils, for seconds in the case of very light oils and with kerosene only while the spray is continuously applied.



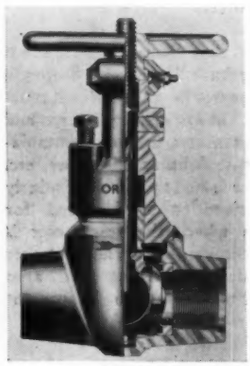
Cutaway view of flame buster hose nozzle for producing emulsion-forming sprays.

The flamebuster nozzle, used to produce emulsion-forming sprays, has two water channels, controlled by a single valve. One channel provides a straight stream for fires beyond the reach of spray. The second channel produces either high-velocity spray with droplets in the larger range of sizes or, by substituting an extension applicator, it produces low-velocity spray with droplets in the smaller range of sizes for use on the lighter oils, kerosene and for controlled burning of highly volatile hydro-carbons too flammable for extinguishment.

Both types of spray and the solid stream are useful in fighting ordinary fires in Class A materials. The Grinnell nozzle operates at ordinary fire-fighting water pressures and is built with large water channels to minimize and practically eliminate the danger of clogging from silt, sand and ordinary water-borne debris.

Forged Steel Valves

PLASTIC packing and welded design are features of forged steel valves of Orbit Valve Co. They are manufactured for service on Christmas trees, manifolds and lines handling oil, water and gas with maximum temperature to 275°F., or for LPG to 150°F. This compact valve is not lubricated against pressure. Lubrication for ease of operation only is not contacted by fluid handled. Friction free seating for easy opening and closing is protected from line of flow and affords positive closure.

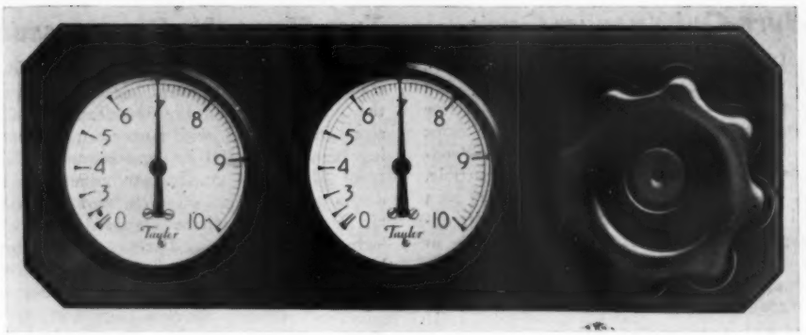


Rapid Pyrometer

THE Leeds & Northrup Co.'s Speedomax type G, a strip-chart Model S pyrometer, is available for use either with thermocouples or Rayotubes. It indicates and records and can be supplied to operate any of the full line of L&N signals and controls. Within all practical limits it can accommodate any external resistance. It can be supplied for any temperature range, for which other L&N recorders can be supplied, as well as for very narrow ranges and for remarkably fast across-the-chart speeds. Instruments with standard ranges provide an accuracy of adjustment of one-third percent of the range.

This pyrometer has been designed for applications where a fast-changing temperature must be recorded or controlled with split-second speed, or where temperatures from many points should be recorded on one chart in such rapid succession that trends show up clearly and data from hitherto unrecorded points can be included.

In experimental laboratories, pilot plants and production departments, single-point recorders of this type follow a key temperature so swiftly, so uninterruptedly, that they detect significant fluctuations in a fraction of a second and provide an unusually detailed operating record.



Transet receiver.

The "Transet" Control System

"TRANSET" is the name given by Taylor Instrument Companies to a new pneumatic transmission system particularly adapted to applications involving long lead lines between transmitter and control panel, and where the compactness of control panel is a consideration. It is applicable to the control of temperature, pressure, rate of flow and liquid level.

The Transet controller regulates the control valve and also transmits air pressure, proportional to the pen movement, to the indicating receiver remotely located on a panel board. The left hand gage of the receiver unit is calibrated in the same units of measurement as the controller chart, thus providing an indication of the controlled variable. The right hand gage of the receiver gives an indication of the set pointer position. Thus when both pointers of the receiver unit coincide, the pen and set pointer of the Transet controller will be together and the process will be under control.

Precise control is achieved by eliminating, or reducing to a minimum, the time lag in the control circuit, because the controller may be located adjacent to the point of measurement.

The Transet receiver is so compact that seven of them take up no more space than two conventional recording receiver-controllers. This means greater economy and convenience for the process engineer who can quickly check all related process variables without having to move all over a large control room. The case contains not only the Transet controller, transmitter and pneumatic set mechanisms, but also allows ample space for either a spring-driven or explosion-proof electric chart clock.

New Leak Detector

CONSOLIDATED ENGINEERING CORP. announces a new leak detector for vacuum or pressure systems. This portable instrument may be used for inspecting finished parts and assemblies, testing vacuum or pressure-tight elements, checking barrier porosity, and maintaining equipment employed in vacuum processes. It is shipped as a complete factory-mounted unit.

The model 24-101 vacuum leak detector (see illustration) is essentially a simplified portable mass spectrometer, designed for the single purpose of detecting minute traces of helium. This is done by the use of a Diatron (mass spectrometer tube) which accomplishes the electronic separation of the helium molecules from all dissimilar molecules in the atmosphere being examined. Thus by connecting the instrument to an evacuated system and applying helium to the suspected areas, it is possible to locate leaks far too small to be detected by other means.

Although most applications of the vacuum leak detector are in the vacuum field, it is also applicable

to pressure systems and elements by the inclusion of helium in the atmosphere surrounding the suspected area or entire unit. It can be readily used anywhere in the plant where 115 volts, 60 cycle power is available. The only operating supplies required are dry ice or liquid nitrogen and helium gas.

Automatic Ethyl Blender

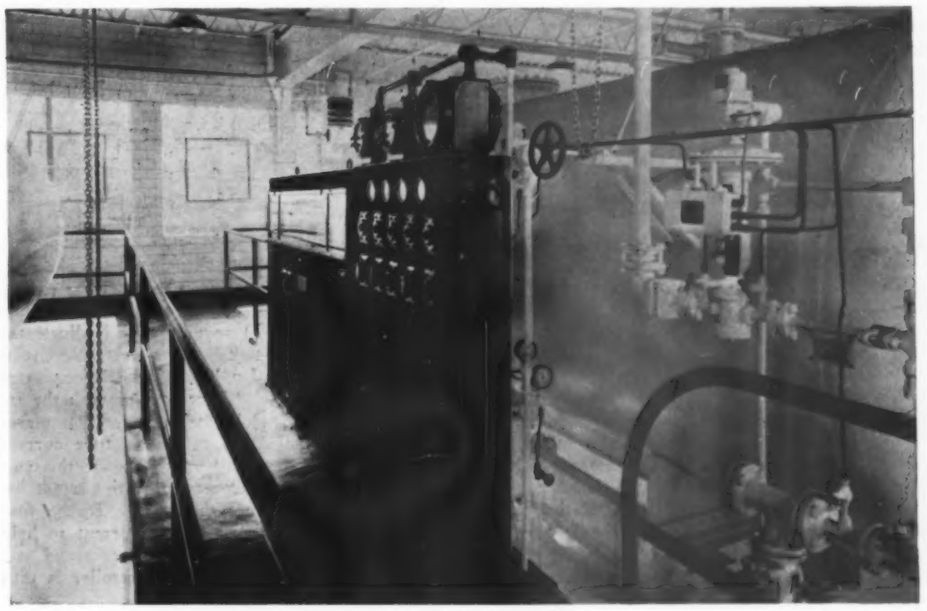
THE continuous automatic Ethyl blender developed by %Proportioneers, Inc.% is a modification of the standard "weigh tank" and eductor unit developed by Ethyl Corp. To the original unit, %Proportioneers, Inc.% have added equipment to provide continuous, automatic blending of gasoline with Ethyl fluid, in any dosage from 2/10 to 6 cc per gallon, despite variations in rate of flow of gasoline being treated. The new control system may be tied into any existing plant by making a T connection. In operation untreated gasoline flows from storage through a "Venturi meter tube" and variations in the rate of gasoline flow are measured by a "flow control transmitter."

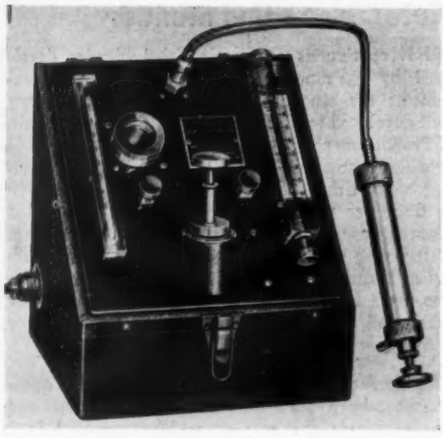
The flow control transmitter actuates the gasoline totalizer on the instrument panel and also regulates the rate at which tetraethyl lead may be withdrawn from the Ethyl weigh tank through the Proportioneers scale head. The purpose of the control is to maintain a desired cc per gallon treating ratio despite changes in rate of gasoline flow.

The scale beam and poise assembly of scale head which counterbalances the Ethyl weigh tank and its contents has been re-designed for greater accuracy and sensitivity and is enclosed in a welded steel cabinet with hinged glass inspection window. The cabinet protects the assembly from stray air currents. The flow control transmitter maintains an exact ratio between the volume of gasoline passing the Venturi meter tube and the loss-in-weight rate at which the poise weight moves along the beam. The ratio of TEL to gasoline is determined by the dosage adjustment in the poise drive.

Any deviation of the scale beam position, showing an unbalance in the system, operates an air control unit to vary the opening of the Ethyl fluid control valve, installed in the line delivering the Ethyl fluid to the eductor. The valve is a special, calibrated unit with an air operated diaphragm motor, responding to the slightest change in position of the scale beam. The air control is such that the valve is opened or closed so as to increase or decrease the amount of Ethyl fluid removed and thus restore the scale beam to a balance point and the system to equilibrium.

%Proportioneers% Ethyl blender.





Dew Point Indicator for Gas

THE Alnor dew point indicator type 7000 is an improved instrument for simple rapid determination of dew point of any non-corrosive gas. Relative humidity, grains moisture per lb., and latent heat can also be obtained by conversion factors. It has many uses in connection with controlled atmospheres in furnaces, and in the chemical and petroleum industries.

Operation is simple and easy; advantage is that indication takes place in an enclosed observation chamber under conditions which can be controlled and reproduced. Condensation takes place suspended in the air or gas sample and the end point or vanishing point may be accurately observed. This instrument does not require an external coolant.

A sample is drawn into the dew point indicator, from the surrounding air or any enclosed space, or from a tank or gas cylinder. It can measure the dew point of high pressure gases through a pressure reducing valve. This dew point indicator for gas is made by Illinois Testing Laboratories.

New Overhead Foam Spray

NATIONAL FOAM SYSTEM, INC., has a new overhead spray deflector system which is designed for use over hazards where flammable liquids are stored, where water sprays would tend to spread the flames, and where foam, instead, will quickly blanket and smother the fire. The new deflectors employ the same foam which was used by the armed forces during the war. Foam may be supplied either from a fixed independent unit which may be completely automatic, or through permanent piping with hose connections at the outer end hooked up with a special foam truck. Deflectors are made in three standard sizes for four different water pressures.

New Skinner Gasoline Purifier

ANOTHER wartime research development released for civilian use is the gasoline purifier manufactured by Skinner Purifiers, Inc. Several hundred thousand purifiers were used in aircraft, land vehicles and naval units in the war. The device purifies gasoline or other fuel by passing it between layers of helically wound ribbons made from impervious material. Dirt and other impurities are stopped at the outer edges of these ribbons and fall into the sediment chamber. Any accumulations on the outer surface of the cylinder can be quickly cleaned off by simply blowing compressed air, or even the breath into the cylinder. The purifier is said to separate free water from gasoline.

Non-Burn-Out Vacuum Gage

A RADICALLY new vacuum measuring gage, designed for operations requiring continuous and accurate measurements of reduced pressures as low as 0.1 micron, is in production by the scientific instrument section of the RCA Engineering Products Department. Made virtually indestructible, the gage, designated as RCA type EMG, has been developed as a separate, easily portable unit, designed especially for modern vacuum systems in which rotary pumps are used to back oil diffusion pumps. Vacuum systems of this type are used in vacuum distillation processes, both in the laboratory and in industry.

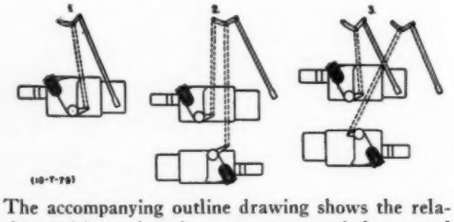
New Blueprinting Machine

MANY firms, particularly those having small or moderate print requirements, are showing interest in the direct process type of print which is developed in fumes of aqueous ammonia. To meet this need, the Paragon-Revolute Corp. has designed its Revolute A finisher which will develop the ammonia type papers now available on the market. This design features the use of perforated stainless steel rollers in place of a stationary perforated plate. Other features are a diaphragm pump for pumping aqueous ammonia to the vaporizing tray, an interval timer for temperature control and a single switch control. The machine provides nearly 100 percent exposure to the ammonia vapor and makes high developing speeds possible in a relatively short distance of travel.

Electronic Temperature Control

THE Brown Instrument Co. announces that electronic principles of continuous control have now been developed for the first time in the industrial thermometer and pressure gage field. Some processes heretofore controllable only with electronic potentiometers can now employ the new Electr-O-Vane. It is applicable, it was said, in hundreds of processes which demand accurate control of temperature ranging from 100 degrees below zero to 1,000 degrees above.

The unit operates on the principle that when a metal vane is interposed between two oscillator coils, the state of oscillation can be made to change or stop in an electronic circuit. This change or stopping oscillation causes the electronic circuit to operate a load relay.



The accompanying outline drawing shows the relative positions of various components of the control circuit within the Electr-O-Vane unit. A dual triode amplifier (7N7) vacuum tube is illustrated at the left of the drawing. The electronic circuit is such that one section of the tube is associated with the oscillating circuit as well as with the relay actuating coil, while the other section serves to supplement the actual oscillating tube current flowing through the relay coil. Use of this second section results in 60 percent more current being available to operate the relay. If the first tube section should fail, sufficient current to hold the relay in cannot flow through the second section itself. Safe failure of the controller is thus assured.

Two Stage Air Compressors

A COMPLETE new line of two-stage, air cooled stationary air compressors has been announced by the Sullivan division, Joy Manufacturing Co. Nine sizes are available, with power requirements ranging from 15 to 100 hp. and piston displacements from 81 to 590 cu. ft. per minute at 100 psi. discharge, based on 60 cycle motor speeds. All air cooled. The three standard electric drive include built-in motor, direct-connected motor and V-belt drive. "Unitairs" may also be equipped for use with gasoline or diesel engines.

Some features include: force-feed lubrication through rifle-drilled oil passages by means of a positive, gear-driven pump; cascade oil cooling; low-lift, large port-area, direct concentric valves; low piston speeds; oversize ball-type main bearings; and four piston rings per piston mounted above the pin.

New Type Fire Equipment

A WATER fog fire nozzle usable with medium pressures normally provided by city water systems has been developed by Bowser, Inc. A 20 ft. projection is possible at 50 lbs. nozzle pressure, and a discharge of 15.9 gpm. At 75 lbs. the projection is 25 ft. with discharge of 19.3 gpm. The new Bowser unit is equipped with a swing joint and quick hose removal without kinking. The unit is recommended for high hazard locations where the protecting fog will protect an operator from intense heat and reduce smoke and gas hazard.

New Fast-Acting Thermohm

A NEW type of industrial thermohm (L&N resistance thermometer bulb) now extends the range of Leeds & Northrup resistance thermometer recorders and controllers to temperatures as high as 1000°F. Speed of response is much faster than that of usual heavy-gage couples and is matched only by small pipe-type or fine wire couples. It is easy to install in ovens, tanks, ducts or pipe lines.

Its own corrosion-resisting stainless tube gives ample protection for normal pressures and non-corrosive fluids. It can be used with protecting wells where required. The temperature coil is thoroughly protected against contamination by moisture or gases. The new thermohm is equipped with the standard universal head that facilitates installation and connection.

A-C Generator

THE principle of electrical resonance, long used for needle-sharp tuning of radios, holds voltage constant in the "Regulectric" a-c generator newly-developed by Electric Machinery Mfg. Co. for use in engine generator sets. The built-in voltage regulating circuit needs no attention in operation to maintain voltage of power-line quality, since the regulator has no moving parts and is factory-set to hold voltage within plus or minus two percent from no load to full load with normal engine speed regulation. The generator is of the revolving-field type and is now built in several ratings.

Continuous Gravity Tester

FISCHER & PORTER CO. announces an improved continuous liquid specific gravity indicator designed for continuous indication of fluid specific gravity in closed piping systems. This tester is constructed to withstand very heavy line strain.

New Arc Welding Electrode

HARDALLOY is the trade name of a new direct current, reverse polarity arc welding electrode, that provides weld metal which is highly resistant to impact or abrasive wear in hard-surfacing applications. The weld metal as deposited tests 59.0 Rockwell "C" hardness and is capable of being heat-treated for machining or grinding, and subsequently re-heat treated to restore it to its as-deposited hardness. The low-hydrogen electrode coating minimizes underbead cracking on hardenable steels. The weld metal fuses readily with the base metal providing a sound, porosity-free alloy for hard-surface applications.

Spraywelder

A NEW type of powder metallizing unit, the Colmonoy Spraywelder, has been announced by Wall Colmonoy Corp. With this new unit it is possible to combine the advantages of both welding and metallizing procedure. The unit is operated in the first part of the process as a powder metallizing unit to apply a uniform overlay of the hard-facing alloy. It is then used as a conventional welding torch to fuse this sprayed overlay to the base metal to obtain a fusion or molecular bond, identical with that obtained when the same alloy in rod form is applied by acetylene welding.

There are only two control valves, both of these being mounted on the gun itself. Once adjusted, the powder flow may be stopped and started at will by pressing or releasing the trigger. The gun is light in weight and may be hand operated or held in a vise or with an attachment in the tool post of a lathe.

While the unit was primarily designed for spraying Colmonoy alloys, it will handle other powdered compositions. The Spraywelder unit consists of the gun, all necessary hoses with connections. The hopper for the powdered metal and the carburetor are combined in a single unit. In addition a panel to hold all the equipment is provided.

New Type Turbine

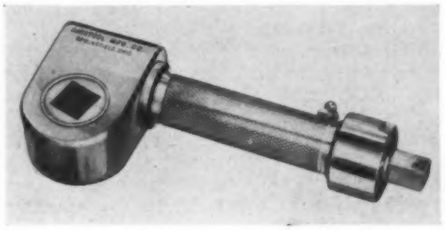
THE Murray type S turbine is the most recent addition to the line of Murray turbines. It is intended primarily for mechanical drive applications. The type S turbine is horizontally split with steam and exhaust connections in the lower half. The rotor may be removed and the machine generally dismantled without disturbing the main frame or breaking high pressure steam or exhaust connections. The steam end bearing cover, the exhaust end bearing cover and governor cover are readily removed for inspection. The turbine shaft extends completely through the governor in large diameter resulting in a rigid stiff mounting and high in critical speed. The shaft may be double extended for driving two machines if necessary.

The governor is completely enclosed in a heavy dust and weatherproof cast housing. The governor is automatic oil ringed lubricated with constant level oiler which replaces the drip oiler. This construction suits the turbine for outside installation. It is provided with a constant speed mechanical type governor which actuates a double seated, balanced stainless steel valve. All external governor levers have been eliminated. The emergency governor is entirely separate from the regulating governor and operates a butterfly trip valve. The overspeed governor can be reset without closing the main steam admission valve. The turbine is supported on feet cast integral with the turbine casing. For high temperature installations, centerline support is furnished.

New Airetool Developments

THREE recent developments have been announced by the Airetool Manufacturing Co., manufacturer of tube cleaners and tube expanders. One is a new right angle gear drive for expanders which simplifies tube rolling where the hand-hole is at right angles to the tube, or in any other hard-to-reach places. It has a one-piece housing which permits pressure lubricant packing. Heat treated alloy steel gears are mounted in bronze bearings. Airetool new tube cleaning motors can be adapted to general utility use with a new hand grip valve. The valve has a one-hand grip with trigger control of the motor speed. Equipped with this valve, Airetool motors can be used for buffing, grinding, cleaning, etc.

A muffler for Airetool's powerful geared small tube cleaner recently has been developed which cuts noise to a point where it is possible to carry on conversation in ordinary tones while the cleaner is in operation.



Right angle gear drive for Airetool expanders.

Tube Turns

A COMPLETE line of stainless steel welding fittings is now being manufactured by Tube Turns Inc. The line includes 45° long radius elbows, 90° long radius elbows, 150° long radius returns, straight tees, reducing outlet tees, caps, eccentric reducers, concentric reducers, lap joint stub ends, laterals and crosses, all in standard and extra heavy weights; and welding neck flanges, slip on flanges, threaded flanges, blind flanges, socket-type welding flanges, reducing flanges, orifice flanges and lap joint flanges. Sizes range from ¾" through 12".

The fittings may be had in three grades of stainless steel; type 304, containing 18 percent chromium and eight percent nickel; type 347, containing 18 percent chromium, eight percent nickel and approximately one percent columbium; and type 316, containing 18 percent chromium, eight percent nickel and two percent molybdenum. Surveys conducted by Tube Turns' engineering service department and other research groups indicate that these grades meet 90 percent of industry's standard requirements. Tube-Turn fittings, including those of stainless steels, are forged to a close grained, uniform metal structure with no locked in residual stresses.

New Dynalog Controller

NOTABLE among the postwar features added to the Foxboro line of instruments is the Dynalog all-electronic recording controller for furnace, fractionating tower top or reboiler control, or other applications in the modern refinery where accuracy, sensitivity and high-speed operation are essential. For applications of temperature measurement or control, Dynalog instruments are available with ranges between —200°F. and +2800°F., and for use with thermocouples or electric resistance bulbs. They are also furnished for applications involving humidity, force, strain, pH, speed, and numerous other process variables. Recorders and recording controllers can be supplied with a giant indicating scale for long-distance reading, as an optional additional feature.

Foxboro electronic temperature controller.

Pipe-Thickness Gage

A NEW thickness gage designed to measure the thickness of iron or steel pipes from the outside has been announced by the Special Products Division of General Electric Company. Called a pipe thickness gage, type MS-A, the new instrument can be used on pipes up to ¼ in. in thickness and from 1 to 2 in. in diameter. Applications include checking the safety factor of pipes and tubing carrying petroleum products, chemicals, steam or gas.

The gage measures the average thickness of a pipe over an area of several square inches. Accuracy of plus or minus 1/64 in. can be obtained on clean surfaces, and 1/32 in. on dirty surfaces. Dirt, scale, and paint on the inside of a pipe do not add to the thickness reading. The gage head and saddle combination weighs about 6½ lb. The instrument operates on 115-volt, 60-cycle power.

Controller for Gas Lift

MERLA TOOL CORP. has developed a new type of surface controller for intermittent gas lift operations. Combining regulation with time cycle control, this unit operates as a regulator when the valve is open, thereby using only the gas sufficient to complete an injection cycle with the lowest possible gas-oil ratio. By merely adjusting the pilot pressure, the unit can be made to operate as a straight time cycle controller if so desired.

When the injection cycle starts and the desired casing pressure build-up is reached, the unit, acting as a regulator, closes the valve, independent of the time cycle unit, and holds the casing pressure constant until the time cycle unit closes. By removing the time cycle unit and adapting the pilot pressure regulator to the valve body assembly, the unit can be used as a gas pressure regulator. The valve can be operated from the bottom or top of the valve seat. Adapting the unit as a gas pressure regulator and placing the valve on top of the valve seat, the unit can be used as a back pressure valve.

The unit can be used as a stop cocking unit with an exceptionally large capacity valve. It can be adapted to operate either as a direct or indirect operating valve. The valve seat is not threaded into the valve body, and there is no pressure on the yoke-valve body joint. Removal of the four yoke bolts gives easy access to the entire valve working parts.

Mobile Fire Pump

A COMPLETE high pressure portable pumping and fire-fighting unit is a development of Porto-Pump, Inc. The Porto-pumper consists basically of a gasoline-driven high pressure utility pump; 75 feet of supply hose and 250 feet of fire hose; an 18 foot three-section extension ladder; fire axe and hand type extinguisher.

The Porto-pumper is easily attached to automobile, jeep or truck. The pump is independently powered with a gasoline engine capable of delivering over 40 U. S. gallons of water per minute at 120 pounds pressure. Any water source serves the unit. Held in position at the rear of the trailer by a patented locking device, the pump is demountable in a fraction of a second and may then be used at any distance from the Porto-pumper as an independent unit. A webfoot base plate prevents sinking into soft ground.

Well Status Recorder

THE PSJ recorder made by Elmer E. Jones is an automatic recorder of oilwell performance that provides a permanent minute-by-minute record of well action. It is simple to install in any part of the line between stuffing box and tank or sump and will furnish permanent records by the day or week. The recorder records changes of stroke, plunger, tubing, need for bailing, experimental work fluctuations, exact time and length of such fluctuations, approximate total volume and exact comparative volume of material produced, length of time spent in servicing well; it will indicate fluid changes, thereby eliminating depthograph service.

The recorder uses no ink and is adapted for either one or two-inch indications. The cast aluminum case contains mechanical linkage from the stylus which measures and records the gate position on a 24-hour or 7-day wax-surfaced chart which is turned by a hermetically sealed Macknic chart clock.

Hard Metals for Flow Chokes

IN flowing wells it has been found essential that the rate of flow be maintained within extremely narrow limits. In wells producing under low pressure the matter of constant flow presents few problems, but in those cases in which pressure is extremely high, the chokes used to control the flow of the liquid take on major importance.

Where tremendously high pressure is encountered the oil is occasionally found to carry a quantity of very fine sand which, under the circumstances, becomes highly abrasive in its action; ordinary flow chokes under such conditions customarily last a few hours at the most before the orifice is worn beyond the allowable limits. Chokes made of Borium (tungsten carbide) are produced by Stoody Company to meet this problem. Borium is the hardest, most wear-resistant metal employed in industry and flow chokes of Borium have set records of hundreds of hours of use without measurable loss in orifice size.

The Borium inserts are enclosed in jackets of mild steel for mounting in the Christmas tree. The inserts are centrifugally cast of pure tungsten carbide to insure maximum density and smoothness in the bore. Ordinarily, chokes are made with a flare at one end, this flare being in the direction of flow. Experience shows that as the oil under high pressure emerges from the small orifice, a considerable turbulence is set up with a major portion of the erosive action concentrated on this flare rather than on the softer metal beyond the flare.

Slush Tubes

The use of large capacity slush pumps with a resultant increase in pressures and mud velocity has in the past few years posed new wear problems on slush tubes in drilling bits. The old steel or case-hardened bushing loses efficiency rapidyy as erosion enlarges the orifice and abrasion takes its toll on the costly bit body. In order to lessen abrasive action and raise drilling efficiency. Stoody Company provides slush tubes of special alloyed hard metal that insure maximum resistance to wear. These slush tubes are produced by centrifugal casting to obtain a fine grain structure, freedom from porosity and an exceedingly smooth bore. These bushings are easily welded into the bit, the welding operation requiring no special equipment or experience on the part of the operator.

New Oil Field Valve

A NEW conduit gate valve, especially designed for high pressure oil field service, has been announced by the McEvoy Company. Features include a system arranged so lubricant is automatically injected from a reservoir to the sealing area whenever it is needed to prevent leakage. Other features include non-distorting seats, gate halves that automatically align themselves to the undistorted seats, and hard chrome plated sealing surfaces.

Success on distillate wells and high temperature, very corrosive wells has led the manufacturer to offer the valve with a guarantee with free repair of any valve that needs service within one year of the time it is shipped from the plant.

Tool-Steel Liners and Rods

THE TOOL STEEL GEAR AND PINION CO. is now offering to the oil drilling industry two new items; one of these is a slush pump liner and the other is a piston rod for a slush pump. "Tool Steel" liners and rods are giving from 2 to 5 times the life of other hardened products in the field because of the extremely hard wearing surface which the hardening process gives. Wearing surfaces on these products range from 650 to 740 Brinell. The depth of penetration of hardness is for the full life of the product.

The Company also offers booster pump liners, sprockets, gears and pinions, sheave wheels and other products that generally are frequently replaced in the oil drilling industry, all made of the same tested "tool steel."

Anti-Corrosion Gaskets

A FIBERGLAS-PLASTIC ring seal gasket, designed to help solve oil and gas well corrosion problems, is announced by Plastic Engineering and Sales Corp. The gasket, available in all standard sizes, is a high-strength, high-dielectric laminate consisting of plies of fiberglas cloth impregnated with a phenolic resin and precision molded under high pressure and temperature.

The high dielectric strength of the new-type gasket makes it possible, by using it in ring sealed joints, to provide insulation against the stray and long line electrical currents that flow from the connecting pipe line system into the uninsulated well structure. Another function is to eliminate galvanic corrosion at the joint. Such galvanic corrosion is particularly severe in high-pressure gas condensate well structures.

The ring seal gasket is designed to stand rough handling in the field and still make a perfect joint. It can be re-used without being re-machined. The gasket has a flat compression strength of 66,245 psi, an edge compression strength of 15,757 psi, and a tensile strength of 48,272 psi. Temperature limit is 480°F.

One pipe line company has started insulating all oil and gas wells by replacing metal rings with the new gasket and using Micarta sleeves and washers around flange bolts. Measurement of current flow into some 125 uninsulated wells showed an appreciable current flow in the direction of the well structure. The flow into many well structures was found to be over 3 amperes. In one well the flow exceeded 11 amperes. In one Gulf Coast field, the total current flow into 34 wells amounted to 125 amperes.

Non-Lubricated Plug

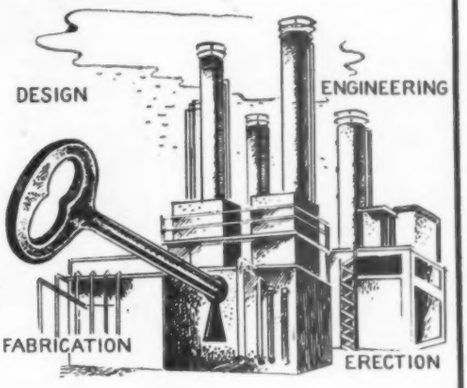
A NEW wrench operated design has been added to the Wedgeplug Valve Company's line of non-lubricated plug type valves. The wrench rotates a cam-equipped head at the top of the valve. The cam surfaces bear against a cross pin in the valve stem to lift the plug from its seat, turn it to open or closed position, and then reseat it. Plug movement is vertical in releasing and reseating, not rotary as in the handwheel and worm gear operated designs. The body contains raised seats made of cast steel, Ampco metal or steel alloys.

Sizes in the wrench operated design include 2 to 8″ for pressures up to 150 lbs.; 1½″ to 8″ for pressures up to 300 lbs.; and 1″ to 6″ for pressures up to 600 lbs.

Test Plugs

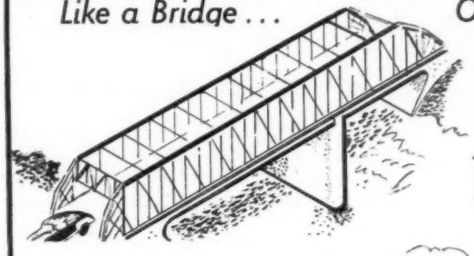
A TEST plug for sealing low pressures up to 100 psi in containers which must be tested has been developed by Mechanical Products Corp. as a supplement to its previously-made high pressure test plug for boilers and other high pressure vessels. The new unit is similar in that it may be inserted or removed in a matter of one or two seconds. Plugs are available for standard pipe sizes from ⅛″ to 4″.

Yes, We'll Do a Turnkey Job on Your Process Plant

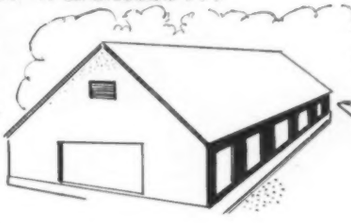


And We Won't Leave You At Sea On Other Needs

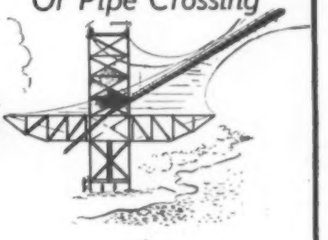
Like a Bridge . . .



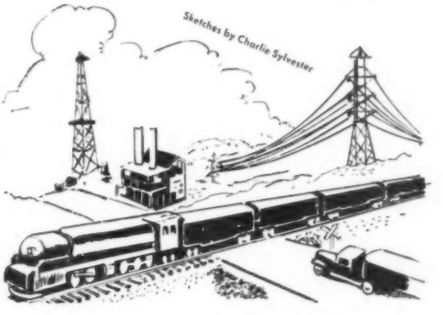
Or Warehouse . . .



Or Pipe Crossing



Or Anything Else You Can Mention We'll Build



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BROWN & ROOT, Inc.

BRITISH OIL EQUIPMENT

Type A Arched girder bridge.

Oil Country Bridges

PETROLEUM engineers are not infrequently called upon to construct large or small bridges for one purpose or another, as well as other steel structures of a more or less permanent character. The materials for these bridges should meet two requirements: availability of structural elements in standardized sizes from which either long or short spans can be built at will; and little maintenance required for the completed structure, particularly as regards painting.

The emergency imposed by the need of rehabilitating war-torn areas was met by British Insulated Callender's Cables Ltd. with the unique designs of Callender-Hamilton bridges, fabricated from standardized and interchangeable elements, the accurate dimensioning of which is assured by the use of special jigs and gages. Temporary derricks or stanchions can easily be formed from the standard bridge parts. A method has been devised whereby a "launching nose" can be constructed from standard parts to skid a skeleton structure across the gap while the main structure is used as a counter-weight and is later hauled into position.

A special feature of Callender-Hamilton bridges is that galvanizing (for which the individual parts of these bridges are ideally suited) almost eliminates painting and maintenance problems and thus adds many years to the life of the structure. The first cost of galvanizing is more than outweighed by the saving of maintenance; none whatever is required for the first 10 or 15 years, and when painting does become necessary, far less cleaning is required than in the case of ungalvanized steel.

The Decca Navigator

THE Decca navigator which was the device used to navigate the leading Allied craft to the Normandy beaches on D-Day with the certainty of landing within a range of 50 yards in any weather or under any visibility conditions, has been developed by Decca Navigator Company, Ltd., into a system for accurate surveys of large areas (up to 50,000-75,000 square miles) in a relatively short time. It can be used independently of weather conditions and at extreme ranges.

The Decca survey system consists of one master and two easily portable radio stations. It lays down two space patterns of wireless rays which are translated in the form of dial readings on a radio receiver; these directly determine the position of the receiver with an accuracy of plus or minus 100 yards at 300 miles; at shorter distances the "fix" is proportionately closer. The radio receiver may be on a ship, a land vehicle or aircraft, or may be carried by one man on foot to any point in a desert or jungle or other place of difficult access. The whole arrangement makes it possible to map an unknown region in a small fraction of the time required by previous methods and at a far smaller cost.

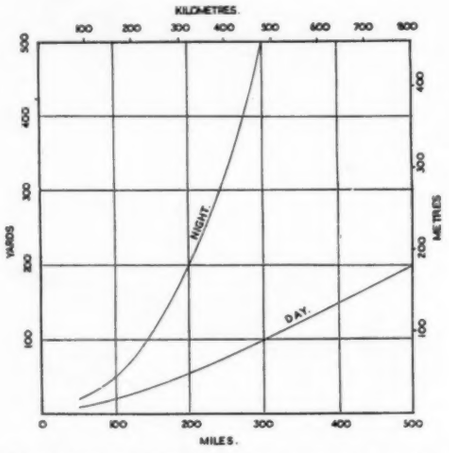


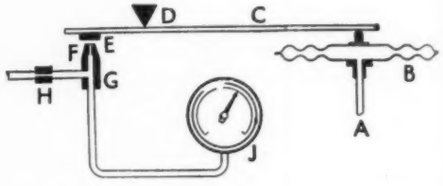
Chart showing Decca Navigator accuracy in yards at various distances by night and day.

This system is not to be confused with radar. Moreover it requires no particular skill on the part of the man who carries the receiver, the use of which can be learned in five minutes.

Low Pressure Amplifier

THE Negretti & Zambra Ltd. low pressure amplifier is a pneumatic means of amplifying a very low pressure to a pressure of 5 psi., and transmitting the result to a receiving instrument. The receiver can be an indicator, recorder or controller calibrated in terms of the original units. This amplifier can convert a pressure change of 0 to 0.3 mm. mercury to a range of 1-5 psi. with a corresponding increase in operating force and a consequent increase in reliability. It is used for measuring or controlling absolute pressure, differential pressure, air or gas flow, air-gas ratio and specific gravity (see diagram). The pressure being measured at A is connected to the inside of a capsule B, so that an increase in pressure raises the end of lever C, which is fulcrumed at D, and thus moves pallet E toward orifice F, reducing the escape area for the air under pressure in capacity G and causing a rise in pressure which is shown on gage J.

With a standard nine-inch indicator, the initial range of 0 to 0.3 mm. mercury is shown over a scale 20 inches in length so that variations in the initial pressure of the order of one percent of 0.3 mm. can be easily read. The air (from a small compressor or works supply) to the orifice system is regulated by a special pressure controller which gives a result entirely unaffected by up-stream pressure changes.



Principle of Negretti & Zambra low pressure amplifier.

Galvanized Oilfield Wire Rope

WHILE not claimed as exactly new, the process originated by British Ropes, Ltd., and known as "BRyanizing" is now recognized as the ideal method of galvanizing steel wires or any other material of steel which is required to resist weathering and corrosion. The original method of galvanizing was the process of "hot dipping" in which the cleaned wires are immersed in a bath of molten zinc, and this method is still largely used. But in this method various impurities are unavoidably present in the zinc, with the result that the coating of zinc on the wires is seldom more than 98.5 percent pure. Zinc of that degree of purity, or impurity, is subject to corrosion by galvanic action. By the method of BRyanizing, however, the zinc is applied by electrolytic deposition and by this means the wire is coated with zinc of 99.99 percent purity; 99.999 percent purity is not unusual.

Another advantage of the BRyanizing method over the "hot dip" process is that it becomes possible, by electrolysis, to give the coating of zinc on the wire any desired thickness, and this coating, instead of having an irregular thickness, is perfectly uniform and concentric on the wire and will neither crack nor flake.

The superiority of electrolytically coated oilfield wire ropes becomes easily seen where drilling operations are conducted in or near the seashore where salty spray promotes rapid corrosion of impure zinc, and in the tropics where heat and excessive humidity actively promote deterioration of the protective coating.

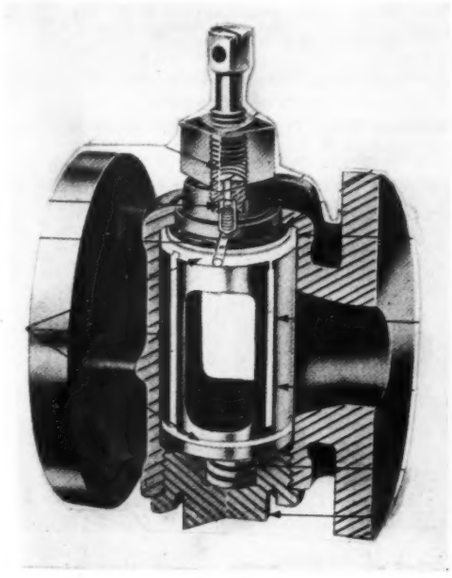
Glandless Lubricated Parallel Plug Valve

AN example of the advancement in valve design is the "Newman-Milliken" Glandless Lubricated Parallel Plug Valve, the development of which has been of special interest to the oil industry. The Valve possesses all the advantages of the plug cock with none of its disadvantages, i.e., it has the quick-opening features with ports to ensure smooth flow and without pockets which allow scale or sediment to collect; yet, having pressure lubrication applied to the sealing portions, is easily operated and the parallel plug prevents any possibility of sticking.

Illustration shows a valve in section, from which it will be noted that the lubricant reservoir is in the stem of the plug; the lubricant (supplied in convenient stick form) is forced under pressure by the lubricant screw through a non-return ball check valve and thence through a feed channel, drilled diametrically in the upper portion of the plug shoulder, and then by vertical grooves to the lower horizontal grooves running peripherally on the face of the plug. The arrangement of grooves is such that the high pressure ducts in direct contact with the full lubricant supply are never exposed to the pipe line flow. Important points are: simplicity and compactness of design, no gaskets or packing, and interchangeability of all parts. The valves are supplied in cast iron, steel, gunmetal, acid resisting bronze, stainless steel, etc., so that there is a valve suitable for every purpose and service ranging from vacuum to 5,000 lbs. per square inch working pressure and at temperatures up to 360°.

The Valves are supplied with either screwed or flanged ends, with either gear or wrench operation and with rectangular or round ports, the last named in cast steel being particularly suitable for oil well Christmas trees, mud lines, pumping manifolds, high pressure natural gas lines and crude oil (where sand is often present and where ordinary valves prove unsatisfactory owing to the abrasive nature of the service). Newman, Hender & Co. Ltd., are the sole manufacturers (under license) of these valves throughout the world, except in the U.S.A. and its Territories.

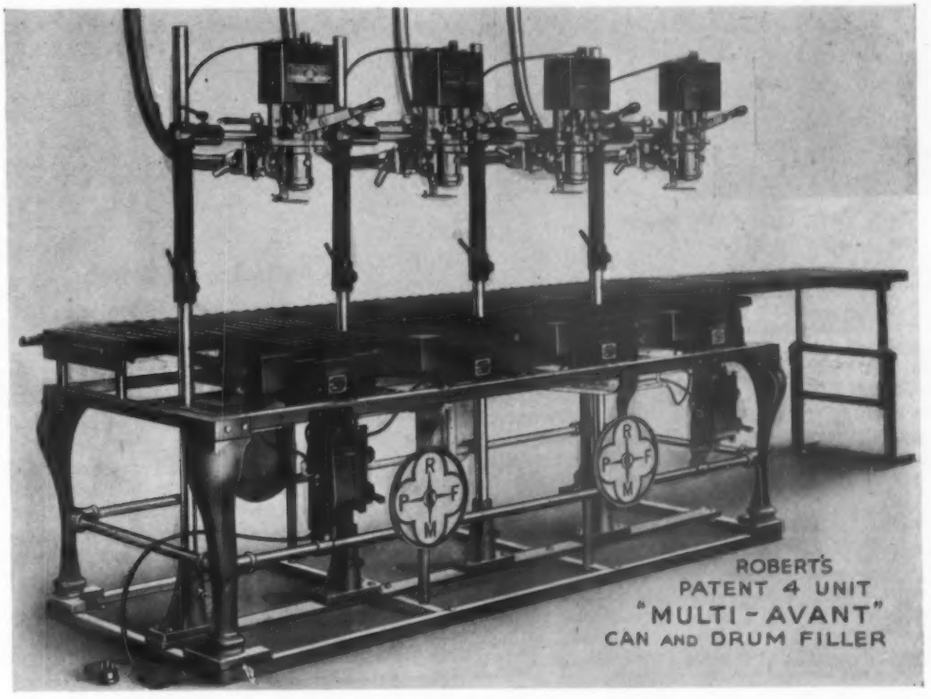
Sectional View of Glandless Lubricated Parallel Plug Valve



Filling Machines for Lube Oils

ROBERTS' PATENT FILLING MACHINE CO., LTD., has recently added to its line several types of can and drum filling machines which will fill containers quickly, and accurately with a minimum of labor. Typical of such machines is the Roberts' patent multi-avant illustrated by the accompanying photo.

The multi-avant is designed primarily for coping with large outputs of lubricating oils into five and 12 gallon drums. These sizes of containers can easily be filled by a girl operator as no lifting of the filled drums is necessary. Empty drums are placed on the scales, and the operator opens the valve of the first filling unit; then proceeds to the other heads. By the time she has reached the end of the battery, the valve of the first filling unit will have closed automatically. This filled drum is then pushed backwards off the skids of the scale plate on to a roller conveyor. The operator then passes on to the second filling unit and repeats the same process. By this method of filling, a very large output can be obtained with a minimum of handling and labor. These can, drum and cask filling machines are weight operated and electrically controlled. Strong, efficient and sensitive scales are employed. This factor plus the incorporation of the electrically operated filling valves ensures remarkable accuracy.



Boiler Circulating Pump

THE new electromersible boiler circulating pump produced by Hayward-Tyler & Co., Ltd. consists of a pump built inside a bulge in the boiler and connected with the outside by an electric cable and a heat exchanger. Both pump and motor are subjected to the full water pressure existing in the boiler system. The pump casing and impeller are at water temperature, but the motor remains at little more than atmospheric temperature due to radiation cooling and the provision of a secondary circulation system using a surface cooler or heat exchanger. No stuffing box is necessary between pump and motor, and the small amount of heat which is not dissipated by radiation is carried away in the cooling water supply. Provision of thermal baffle plates between the pump and motor and the low conductivity of the specially designed shaft and casing prevent any harmful rise of motor temperature.

High pressure-high temperature stuffing boxes, the most troublesome and costly maintenance items in boiler circulating pumps, are completely eliminated. The nature of the integral pump and motor unit, assembled within a rigidly bolted single structure, permits connection to the pipe system without any special means of support; such complex items as carefully aligned bedplates, anchored pipes, center-line suspension and water cooled pedestals are avoided.

A New Mapping Instrument

THE Fairchild Camera and Instrument Corp. has announced the development of a new mapping instrument, the Rectoplanigraph, to provide the map-maker with a simple means of rectifying and transferring planimetric detail from aerial photographs to maps and charts. Based on the principle of the camera lucida, the Rectoplanigraph is easy to use. As a companion piece to more elaborate stereoscopic mapping instruments, it enables the map-maker to fill in secondary details quickly after major control points have been established.

The Rectoplanigraph is a portable, light-weight instrument easily assembled and disassembled, and can be set on a drafting table. Its design provides indexed adjustments for three focal lengths, a micrometer adjustment for all variations in scale, and other adjustments for rectification of the photographs to compensate for errors introduced by tip and tilt. A high quality prism is used to assure a sharp, well-illuminated image.

International News and Notes

Colonel Louis Pineau

Names Pineau to Foreign Post

Colonel Louis Pineau, president of the Permanent Council of World Petroleum Congresses (London), has been named as advisor on foreign business to Houdry Process Corp. Mr. Pineau recently visited the Houdry Laboratories in the United States, where his old-time acquaintance with Eugene J. Houdry and associates was renewed, and then returned to his Paris headquarters with Mr. Houdry.

An internationally-known figure in the petroleum industry, Colonel Pineau, in addition to being president of the Permanent Council of World Petroleum Congresses (London), is administrator general of the Maison de la Chimie (Association of French Chemical Industries) and is honorary president of the French Association of Petroleum Technologists.

British Detergent Plant

Manchester Oil Refinery Ltd., Manchester, England, is building a full-scale plant for the manufacture of a petroleum-derived detergent/wetting agent. The product will be known as Petrosol Powder and will consist of 80 percent sulfonate of hydrocarbons and 20 percent anhydrous sodium sulfate. Intensive research work on the petroleum sulfonates group has led to this development, aided by the outstanding success of the parallel liquid product, Petrosol 33, which has proved itself in practical application to a wide range of industrial, commercial and specialized uses.

The plant will come into operation within the next few months, and it is estimated that production will be equivalent to approximately 7,000 tons annually of so-called "conventional" soaps. Quantity production of the powder will be made possible by the installation of spray-drying equipment for the handling of large volumes of aqueous solution which form the basis of the product. Petrosol Powder will be distributed through Petromor Ltd., (a member of the M.O.R. Group of Companies) whose offices are at Jacey House, 16, Oxford Street, Manchester 1.

Venezuela Production

Production of crude oil in Venezuela during the month of February amounted to 32,720,134 barrels an average of 1,168,576 barrels daily. As compared with January, this daily average is higher by 15,580 barrels. Exports for the month were 31,038,779 barrels. Production by companies is shown in the following table:

Company	West	East	Total
Creole	12,491,319	4,286,782	16,778,101
Mene Grande	1,531,829	3,977,560	5,509,389
Shell	8,838,421	—	8,838,421
Consolidada	—	626,758	626,758
Socony	—	728,100	728,100
Texas	—	183,967	183,967
B. C. O.	28,942	—	28,942
Orinoco	6,999	—	6,999
Guasare	1,069	—	1,069
Phillips	—	7,164	7,164
S.A.P. Las Mercedes	—	9,853	9,853
Atlantic	—	1,371	1,371

New Australian Oil Search

Vacuum Oil Co., Pty., Ltd., is joining with other Australian and British interests to carry out an intensified search for oil and gas on the Australian continent. Two new Australian companies are being organized for the purpose. Although drilling has not succeeded thus far in finding oil in commercial quantities in Australia, Vacuum Oil Co. geologists take the view that the geological and geophysical work done by other oil companies in that country, even in areas considered most favorable for oil accumulation, is inconclusive. They plan to continue the search, using the latest methods and equipment.

Vacuum Oil Co., which markets petroleum products throughout Australia, New Zealand and islands of the South Pacific, will supervise the technical operations of the new exploration companies. Vacuum will own a one-third interest, and the other two-thirds will be equally divided between D'Arcy Exploration Co., a subsidiary of Anglo Iranian, and Zinc Corp., Ltd. The latter has extensive mining interests in Australia, including the famous Broken Hill mines in New South Wales with their rich lodes of zinc, Silver and lead.

One of the new companies will be known as the Frome-Broken Hill Co., Pty., Ltd., and will immediately start on comprehensive geological and geophysical surveys within an extensive area which includes part of South Australia, Queensland and New South Wales. A gravity meter crew is now on its way to Australia to begin this work. The other new company, Bonaparte Gulf Co. Pty., Ltd., will investigate large unexplored areas in Northern Territory and Western Australia. Preliminary aerial and surface geological reconnaissance will be carried out under the direction of Dr. Frank Reeves, who has already arrived at Melbourne from the United States. Dr. Robert Sauve will coordinate the exploration work of the two new companies. A prominent geophysicist, he has had extensive experience with a subsidiary of Standard-Vacuum in the Netherlands East Indies.

Acticarbon Changes Name

ACTICARBON LTD., 175 Piccadilly, London, W.1. announce that the name of the company has been changed to THE BRITISH CECA COMPANY, LTD. The address remains the same.

The change has been made to bring the name in the British Empire into line with the world-wide organization of CECA (Carbonization et Charbons Actifs) of Paris, whose patented and technical processes are used.

THE plants for Solvent Recovery by the "ACTICARBONE" process, for Electrostatic Precipitation by the "ACTIFILTER" process and for air drying by the "ACTISEC" process, are all British made and the combined technical experience of the SECA group, with affiliated companies in other countries is available.

The activated carbon "ACTICARBONE" for solvent recovery is being produced in Great Britain and more extensive factory premises have been acquired for this purpose.

Large developments are also in hand for the sale of finished materials of North African origin, produced by CECA, such as Activated Earths, Bentonites, Kieselguhr, and Filter Aids.

New Wakefield Directors

W. F. List has joined the board of C. C. Wakefield & Co., Ltd., as a director and will be responsible for overseas development. He began his career with Wakefield's in 1910 and after five years of active service in World War I, he transferred to the company's overseas organization. Having spent over twenty years abroad managing Castrol affairs in India and South Africa, he returned to the U.K. in 1946 to become overseas general manager. His most recent African post was at Johannesburg where he served as a major in the South African Home Defense Corps earning commendation in the 1945 King's Birthday Honours.

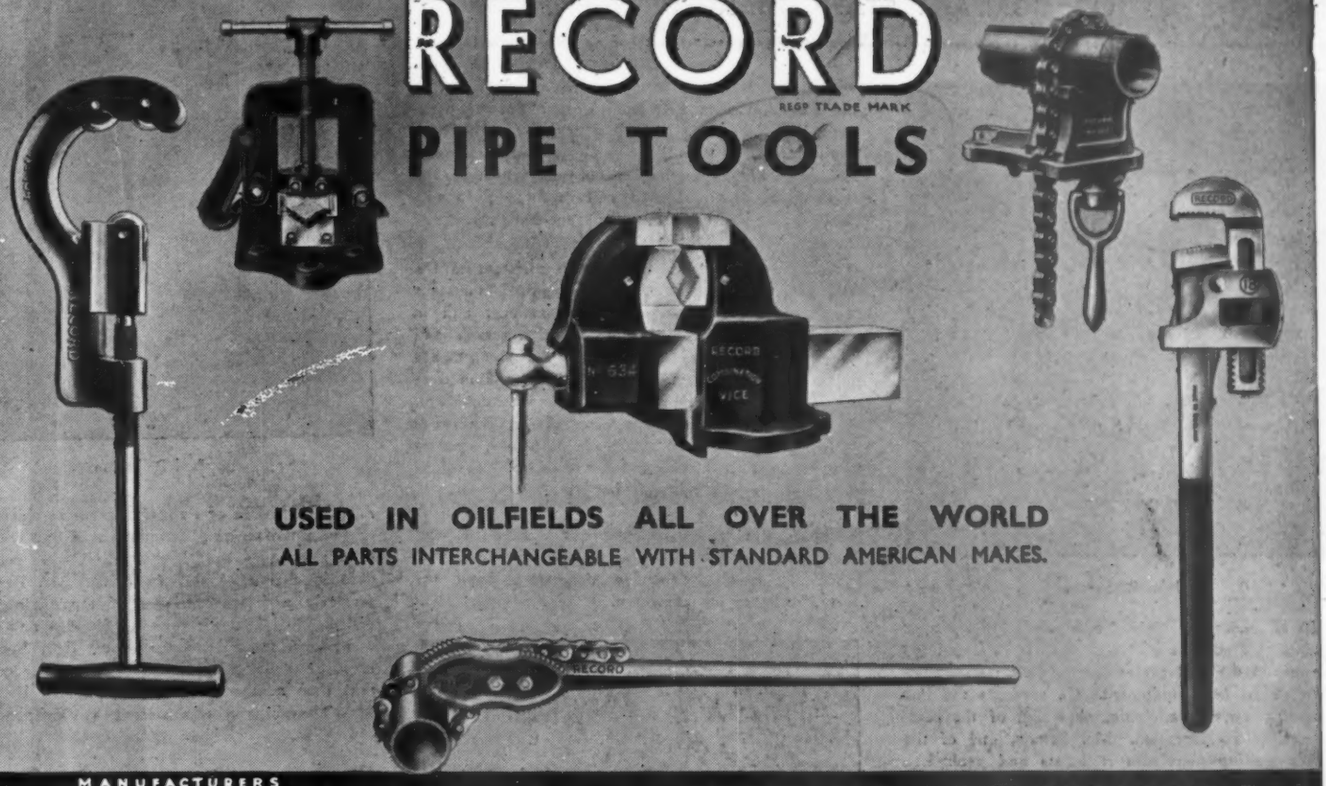
L. M. Broadway, who has been with the company for 27 years, has also been elected a director. He has been secretary of the company since 1938 and will continue to hold this appointment.

L. M. Broadway W. F. List

RECORD

REGD TRADE MARK

PIPE TOOLS



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CONNERSVILLE
AIR BLOWERS

FOUNDED 1850
HOLMES
HUDDERSFIELD

These machines deliver a positive, reliable and oil-free supply of air, economically and efficiently. Absence of internal contact ensures long life, low maintenance costs and continuous operation over long periods.

It is also extensively used for Gas Exhausting or Boosting and over 1,400 machines have been supplied for these purposes.

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MIDLANDS OFFICE. 21 BENNETT'S HILL, BIRMINGHAM, 2

OIL COMPANY STAFF CHANGES

John R. Suman

JOHN R. SUMAN, New York, vice president of Standard Oil Company (N.J.) has been appointed chairman of the API central committee on standardization of oil field equipment. He succeeds the late J. Edgar Pew, Philadelphia, chairman of the committee since its inception. Mr. Suman, one of the nation's leading petroleum engineers and geologists, was one of Mr. Pew's chief lieutenants in the distinguished work of this committee. More than 90 percent of the oil field equipment manufactured in the world conforms to API specifications, at an estimated saving of $15,000,000 a year.

W. F. Bramstedt

W. F. BRAMSTEDT has been elected vice president in charge of crude oil sales of California Texas Oil Co., Ltd. He has been technical representative on crude oil sales of Arabian American Oil Co. For the past twenty years, since February 1927, he has been connected with the engineering, refining and crude oil divisions of the oil industry. During the war years he was in White Horse, Yukon Territory, as project manager in the field for the operation and maintenance of the Canol refinery and pipe line system. Previously he served Standard Oil Co. of California and its Canadian subsidiary in refining and marine operations.

BRUCE K. BROWN has been elected president of the Pan American Petroleum Corp. Former president Dr. Robert E. Wilson steps up to the board chairmanship of Pan-Am, wholly owned direct subsidiary of Standard Oil (Indiana), of which he also is chairman. Mr. Brown will continue as a vice president and director of the parent company.

Mr. Brown joined Standard as an assistant to Dr. Wilson in 1929. In 1935 he was appointed manager of the development and patent department and in 1938 he became general manager of research and development. He was in charge of the government's part in 100-octane aviation gasoline production during the war. For many months he was chairman of PAW's domestic operating committee. Returning to his old position at Standard, he was elected a vice president in 1945 and took charge of development. He is now relinquishing that assignment.

Joseph K. Roberts, general manager of research, who has been under Mr. Brown's general direction, will henceforth, as an independent department head, report directly to the chairman.

Greer W. Orton A. M. Ottignon

GREER W. ORTON has been appointed general manager of the foreign operations departments of The Texas Company, and A. M. Ottignon has been named to succeed Mr. Orton as assistant to the president.

Mr. Orton has served as assistant to the president since January, 1946. Before that he was manager of Texaco's purchasing department. He first entered the service of the company in 1928. For ten years he held various positions, foreign and domestic, in the comptroller's department. He then entered the purchasing department and became manager in 1943.

Mr. Ottignon has been supervisor of supplies and distribution for the refining department of The Texas Company. He joined Texaco when he was 15 years old as an office boy, 32 years ago. He became assistant to the general manager of the refining department in 1938 and was named supervisor of supplies and distribution in December, 1942.

JAMES V. BROWN of Washington, D. C., has been appointed secretary-treasurer of the National Petroleum Council. For several years Mr. Brown has been with the Independent Petroleum Assn. of America as a statistician and analyst. He was secretary of the Petroleum Industry War Council's production committee and subcommittee on petroleum economics and vice chairman of the economics advisory committee of the Interstate Oil Compact Commission.

Paul D. Barton

APPOINTMENT of Paul D. Barton as chief engineer of the manufacturing department of Sun Oil Co. has been announced by Clarence H. Thayer, vice president in charge of manufacturing. Mr. Barton was formerly assistant manager of the engineering division. He joined the company in 1934 and has been responsible for the design of all light hydrocarbon recovery and fractionation plants constructed since that time at the company's refineries. He succeeds Mr. Thayer who was elected a vice president on March 18.

Mr. Barton joined General Petroleum Corp. at Los Angeles in 1920. In 1923 he became superintendent of natural gasoline operations for United Oil Co. (later Richfield) in the Signal Hill field. He subsequently became manager of the company's natural gas department and was elected first president of the California Natural Gasoline Association. In 1926 he resigned from Richfield to become a consulting chemical engineer in the design and construction of natural gasoline extraction plants both in the field and in refineries. He came to Sun in 1932 as a consultant.

W. W. Flenniken

W. W. (Bill) FLENNIKEN, former sales manager and director of advertising for the Halliburton Oil Well Cementing Co., resigned recently to join Fred M. Manning, Inc., of Denver as general manager of operations. The Manning organization, drilling contractors in the Rocky Mountain area, also has production in Kansas, Oklahoma and Texas.

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C. G. Kirkbide

C. G. KIRKBRIDE, former professor of chemical engineering at Texas A & M College, has joined Houdry Process Corp. as director of the Houdry Laboratories. These laboratories occupy eight research buildings near Marcus Hook, Pa., and employ more than three hundred fifty research people.

Mr. Kirkbride taught chemical engineering at Texas A & M for two years after having served as chief of chemical engineering development for Magnolia Petroleum Co. at Dallas. Formerly he was assistant director of research for Pan American Refining Co. and research engineer with Standard Oil Co. (Ind.)

Johns Hopkins Congdon Vernon Lee Whitney

JOHNS HOPKINS CONGDON and Vernon Lee Whitney, directors of Standard-Vacuum Oil Co., have retired. Each has been with the organization thirty-one years. Mr. Congdon started in the oil business in 1907 as a fireman on a refinery still. He joined the Vacuum Oil Co. in 1916 and was made general manager at Hong Kong. In 1920 he was appointed managing director at Capetown for Vacuum Oil Co. of South Africa, returning to New York in 1929. He became a director of the newly-formed Standard-Vacuum organization in 1933. He has continued to supervise the South African activities of the company as well as all its lubricating business.

Mr. Whitney, who has been in charge of Standard-Vacuum's India business, is a veteran of the Far East. He went to the Philippines in 1907 with the Army. After five years under General Pershing, he was appointed the first civilian governor of Sulu Province. His career in oil began as a salesman in India in 1916. He was Standard-Vacuum's general manager for that territory when, in 1941, he first reached retirement age under the company's plan. Because of his wide knowledge of Indian matters, he was persuaded to postpone his retirement during the war period and to serve on the board of directors.

W. E. CURRAN has been named general manager of Rheem Manufacturing Co., it was announced by R. S. Rheem, president. He is also vice president and director. Joining Rheem in 1942, Mr. Curran was made vice president in charge of production in 1943, and in February of 1946 was elected a director. He will continue to make his headquarters in New York.

H. M. Nelly, Jr.

H. M. NELLY, Jr., manager of the Petroleum division of J. F. Pritchard & Co. has resigned his position with that company to become vice president and one of the owners of Refinery Maintenance Company at Compton, California. The company is engaged in plant construction and maintenance in the petroleum refining and chemical industries.

Mr. Nelly's engineering education was obtained at the University of Michigan and Massachusetts Institute of Technology. He received a B.S. degree from the former in 1928 and an M.S. from the latter in 1930. From 1930 to 1941 he was on the engineering staff of The M. W. Kellogg Company and since 1941 has been manager of the Petroleum Division of J. F. Pritchard & Co. with his headquarters at Houston, Texas. In that capacity he has directed the construction of a number of refining and natural gasoline plants and has attained a wide acquaintance and a high professional reputation in the industry.

G. W. HOLBROOK of Bradley Producing Corp., Wellsville, N. Y., was named chairman of the production research advisory committee of the Pennsylvania Grade Crude Oil Association at a recent meeting of the board of directors. He succeeds Wilson K. Page of Olean, N. Y., who resigned.
Dr. Richard V. Hughes, association director of production research, analyzed the progress to date and voiced confidence in future attainments.

D. D. MONROE has been appointed an assistant general sales manager of The Texas Co. at New York. R. R. Kibbe, manager of the central territory with headquarters at Chicago, succeeds Mr. Monroe as manager of the northern territory. S. C. Bartlett, assistant manager of the central territory, has been promoted to manager.

Col. Freeman W. Burford

COL. FREEMAN W. BURFORD has been elected president of the Sid Richardson Refining Co. which recently purchased refining properties of the American Liberty Oil Company at Texas City, Texas. Mr. Burford maintains his offices in the Wilson Building in Dallas.

During the war, Col. Burford was chief of the petroleum branch G-4 headquarters European theatre of operations from February 1944 to July 1945. Subsequently he was chief of the petroleum branch headquarters in the European theatre. He was responsible for building and operating 3,500 miles of gasoline pipe lines in Europe and as a result of his work was decorated by France as well as by the United States. He won the bronze star, Legion of Merit and French Legion of Honor and Croix de Guerre with palm.

Floyd L. Senter

Chas. W. Thornhill

CHAS. W. THORNHILL of the Thornhill-Craver Co. and Floyd L. Senter of the National Tank Co. have been named president and secretary treasurer, respectively, of the National Board of Regents of Nomads for the ensuing year. Both new officers are charter members of the Houston Chapter.

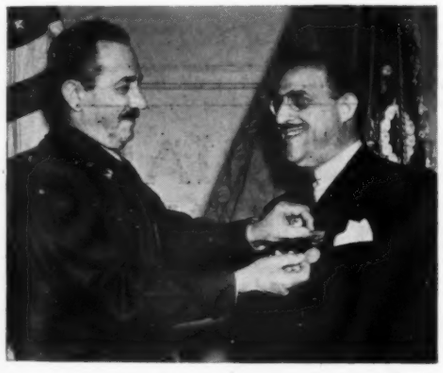
HOWARD G. MEYERS has been appointed manager of Richfield Oil Co.'s merchandising department, succeeding the late J. R. Haden. Joining Richfield in 1933, Mr. Meyers first served as service station supervisor in the company's Long Island City and Philadelphia branches. From 1944 to 1946 he was on military leave with the Navy as a lieutenant assigned to petroleum supply.

Elihu Madison

ELIHU MADISON has been appointed economist for The Texas Company. He entered company service in 1929 in the accounting office of the refining department in Houston, and was transferred to the New York offices in 1933.

E. P. Corey Retires

EDWIN P. COREY has retired as general manager of tubular sales of The Youngstown Sheet and Tube Company after 52 years in the pipe business. He had been with Youngstown since 1923. Previously he had been with the National Tube Company since 1895. Mr. Corey was chairman of the Steel Pipe Research Committee of the American Iron and Steel Institute, and is a counselor of the American Petroleum Institute.



LESTER M. GOLDSMITH, chief engineer of The Atlantic Refining Co. has received the decoration for exceptional civilian service for his contributions to the installation of "Pluto," the oil pipe line under the English Channel preceding the invasion of Normandy. Presentation was made in Washington by Lt. Gen. R. A. Wheeler, chief of engineers of the U. S. Army.

Early in 1943 Dr. Goldsmith and Col. John R. Leavell, originator of the idea, proposed the submarine pipe line to support troops until harbor facilities could be established for the handling of petroleum products. The "Goldsmith-Leavell" plan proposed that four-inch seamless tubing be welded into sections approximately four to five miles in length, towed to sea and spotted in such position that the ends of each successive length could be joined by a short section of flexible coupling called a "Grasshopper." On November 22, 1943, Dr. Goldsmith was appointed consultant on the project. He was sent to England to assist in the preparations and helped procure and deliver large quantities of vitally needed cable.

DR. FREDERIC H. LAHEE of Dallas, chief geologist for Sun Oil Co., was elected to honorary membership for "distinguished service to the cause of petroleum geology" at the recent annual meeting of the American Association of Petroleum Geologists. Thirty-one members of the A.A.P.G. have been thus distinguished during the past 28 years, in a total membership of five thousand. Dr. Lahee is widely known in geological science as the author of the textbook and manual, "Field Geology," first published in 1916 and subsequently issued in several up-to-date editions. He has held many offices in the A.A.P.G., and was editor of the Association Bulletin from 1929 to 1931 and president in 1932. He is recognized as one of the leading students of geological science.

Robert Smallman

ROBERT SMALLMAN has been appointed director of sales and field engineering of Consolidated Engineering Corp., Pasadena, Calif. He comes to this organization after 14 years of technical research, publicity and sales work.

A. L. WILSON has been appointed general sales manager of Shell Oil Company of Canada, Limited. Mr. Wilson joined Shell as a service station attendant in 1932. By 1941 he had held several sales managerial posts in eastern Canada, British Columbia and the West and East coasts of the United States. During the war years he was loaned by Shell to the government. With the cessation of hostilities, Mr. Wilson was transferred to the New York office of Shell Oil Company as assistant to the retail sales manager. He returned to Canada in February, 1946, as manager of wholesale sales.

J. W. LIDDELL, northern sales manager in Chicago for Continental Oil Co., has been transferred to Fort Worth, Texas, as southern sales manager. J. L. Wait, marketing division manager, Chicago, has been made northern sales manager to succeed Liddell, and E. C. Walter, assistant division manager, Chicago, succeeds Wait as division manager. The three-way move was made necessary by the retirement of T. H. Lawson, a member of the Continental organization for 27 years and southern sales manager since 1935.

E. H. WELLEMEYER, assistant manager of the Cities Service export department has been elected vice president and director of Cities Service Oil Company (Pa.). From 1923 to 1929 he was assistant superintendent, then superintendent of Cities Service Export Oil Company at St. Rose, La. Later he had broad foreign experience in India, London and Paris.

Dr. Theodore W. Evans

DR. THEODORE W. EVANS has been appointed manager of the Emeryville (Calif.) research laboratories of Shell Development Co., succeeding the late Walter J. Hund. Dr. Evans joined the Emeryville staff in 1930 as a research chemist and was active in the early development of alcohols, ethers and esters from refinery cracked gases and in the development of the solvent extraction theory and the production of synthetic glycerin from petroleum. By 1941 he was supervising all exploratory studies on new chemicals as well as research on their application in such fields as surface coating and resins. He was appointed an associate director of research in 1942.

Capt. Doyle D. Buttolph

CAPT. DOYLE D. BUTTOLPH has been appointed manager of the mechanical equipment division of the chemical engineering department of Phillips Petroleum Company. Mr. Buttolph joined Phillips in 1940. He served in the army for three years and ten months, mostly at the Aberdeen Proving Grounds in Maryland. He was discharged from the service with the rank of captain.

GARTH L. YOUNG, chief engineer, was recently elected vice president of the Signal Oil and Gas Company. Mr. Young has for some time been a vice president and director of Signal Oil Coompany, the company's marketing subsidiary, but now serves as vice president and director of the parent company as well.

Harry A. Gibbon Albert Wright, Jr.

HARRY A. GIBBON of Scarsdale, N. Y., has been appointed general manager in the Netherlands Indies for Nederlandsche Kolonial Petroleum Maatschappij, it was announced by L. W. Elliott, president of Standard-Vacuum Oil Company. N.K.P.M. is the producing and refining subsidiary of Standard-Vacuum with a large refining installation near Palembang as as well as oil fields in Sumatra. N.K.P.M. has named Albert Wright, Jr., also of Scarsdale, as assistant general manager succeeding Mr. Gibbon. Both men will make their headquarters in the Indies.

Mr. Gibbon is a Texan who came to Standard-Vacuum in 1939 from Humble Oil & Refining Company. He was transferred to N.K.P.M. after the war and proceeded to Batavia, Java, after the Japanese surrender made it possible for that company to start planning the rehabilitation of its refinery and oil field properties in Sumatra.

Mr. Wright joined N.K.P.M. in 1938 after fourteen years' experience in the oil fields of Venezuela and in the Middle East. He has been production manager for NKPM and until recently has been temporarily assigned to that company's headquarters at the Hague.

THREE veteran employees of Standard Oil Co. of New Jersey, whose combined length of service totals 74 years, have been advanced in executive sales positions. They are E. S. Diggs of Baltimore, manager of the Delaware-Maryland-D. C. division, who becomes assistant manager of the southern sales region with offices in New York; C. A. Newland, division manager of Charleston, West Virginia, who succeeds Mr. Diggs, and A. R. Martin, assistant to the general sales manager in New York, who becomes acting manager of the West Virginia division.

LADISH CO., Cudahy, Wisconsin, has opened a new district office in Atlanta and discontinued its New Orleans office. The new office will be located at 452 Spring St., N.W. and will serve the southeastern territory. W. W. Bowie, formerly manager of the New Orleans office, has been appointed manager to direct the sale of the complete line of Ladish controlled quality seamless welding fittings, Ladish forged steel fittings and Ladish forged steel flanges in this territory.

H. E. Bramston-Cook has been made general sales manager of Oronite Chemical Company, Standard of California chemical subsidiary. Bramston-Cook served in the Canadian Army in the first World War, joining when only 15 years old. In the last war he served as a line captain in the U. S. Navy and was awarded the Legion of Merit.

Henderson Supplee, Jr.

HENDERSON SUPPLEE, JR., has been elected a vice president of The Atlantic Refining Company. He resigned as president of the Supplee-Wills-Jones Milk Co. to join Atlantic.

JOSEPH N. PEW, JR., chairman of Sun Oil Co., announced the creation of a five-member executive committee. Members are Joseph N. Pew, Jr., chairman; Robert G. Dunlop, president; S. B. Eckert, vice president in charge of marketing; C. H. Thayer, vice president in charge of manufacturing, and Jno. G. Pew, vice president in charge of production.

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Organizes New Division

Dennis F. McCarthy has been named manager of the new tubular goods division of the A. O. Smith Corp., a division which handles the manufacture and sale of steel pipe for oil and natural gas lines and oil well casing. While the company for many years has been one of the largest manufacturers of such products, the formal establishment of the new division represents a move toward greater efficiency in one of the company's major operations. Mr. McCarthy has been in the sales department of the company for 11 years and has been closely associated with the sale of tubular goods since 1938.

Passing of Dad Joiner

Columbus M. Joiner, better known among oil men as Dad Joiner, passed away at Dallas, Texas, on March 27 at the age of 87. His name became a household word in the Southwest through his discovery of the great East Texas field. The discovery well was the Daisy Bradford, located in Rusk County, Texas. It was brought in October 3, 1930, near Joinerville, and flowed 400 barrels a day. It was the third well drilled by Joiner in the area, the two previous bores being dry holes. According to Joiner, he drilled the wells "on a hunch" in the face of geologic opinion that the section contained no oil.

Road Test Results

In a series of road tests with both pre- and postwar cars, the Natural Gasoline Association of America is finding that more volatile fuels give trouble-free operation at atmospheric temperatures ranging up to 70°F. Though undertaken as a study of winter motor fuels, incomplete results in spring-like temperatures indicate most car models can safely handle fuels having a vapor pressure at least two pounds higher than present regulations permit. The test series is being conducted in Oklahoma by the NGAA technical committee under the direct supervision of H. R. Legatski, Phillips Petroleum Co. chairman.

In all but one of the cars tested thus far, the RVP for safety from vapor lock at atmospheric temperatures of 60°F. has been found to be 17.75 and 18.75 for the respective high and low volatility fuels. The tentative conclusion being drawn from this information is that the permissible vapor pressure for winter grade fuels could safely be raised from 13 to 15 lbs.

In commenting on the tests, NGAA president J. H. Dunn, The Shamrock Oil and Gas Corp., Amarillo, stated: "If the permissible vapor pressure of winter fuels can be raised by two pounds, it could easily mean that the northern motor fuel market would absorb more than a million barrels of additional n-butane. It is also reasonable to conclude that spring and fall motor fuels of the same area could stand a one-pound increase, thus absorbing even more light ends from both the refining and natural gasoline industries."

Buys Catalyst Plant

The Davison Chemical Corp. has completed arrangements with the War Assets Administration for the purchase of a synthetic catalyst plant at Cincinnati, Ohio. Davison is now operating this plant in the manufacture of synthetic fluid catalysts for fluid cracking plants. Increased producing capacity is planned. The first commercial fluid synthetic catalyst was produced by Davison for use in the modern fluid catalytic cracking units as part of the war program.

Shell Refinery Wins Safety Award

Employees in the Wilmington-Dominguez Refinery of Shell Oil Co., Inc., recently were awarded and American Petroleum Institute accident prevention certificate for 1,279,349 hours of work without a single disabling injury. The new safety record was set between July 14 and December 30, 1946, and is one of the outstanding safety achievements of the oil industry, said R. W. McOmie, refinery manager. As a basis of comparison, he added, it would take ten men 50 years to work one million hours.

Markets Aromatic Solvents

The Standard Oil Co. (Ohio) is now marketing Toluol, Xylol and other aromatic solvents made synthetically from petroleum as a peacetime follow-up on the production of nitration grade toluene during the war. Several are direct replacements for coal-tar solvents and may be used to supplement the supply of coal-tar solvents or in combination with other petroleum solvents.

New Rodpak Executive

G. M. Forslund has been elected vice president in charge of sales for Rodpak Manufacturing Co., San Francisco. Roy Hamilton, one of the founders, continues as president. Mr. Forslund will push the sales of an improved floating seal metallic packing which will hold higher pressures and have a longer life. A single unit of the new type packing will hold 1,500 psi. hydraulic pressure, whereas three segments of the old type would have been required.

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Committee Foresees U. S. Demand of 5,800,000 Barrels

COMING at a time when the full implications of the large increase in demand for petroleum products during the first quarter of 1947 are beginning to make themselves understood, when refiners in many parts of the country are warried about their future crude supply and when a shortage in distillate fuels for next winter is being widely predicted, the report of the Economics Advisory Committee of the Interstate Oil Compact Commission, presented at the Compact meeting in Birmingham, Alabama, on April 25, has aroused widespread attention and discussion. While the committee examined in detail the conditions and requirements in different sections of the country, the following excerpts contain its discussion of the general situation:

Crude oil production and refinery crude runs in the United States of about 5,000,000 b/d will be required for the next 12 months to meet demand as estimated by the committee. Such a rate would represent capacity operations, particularly east of California. The best efforts of the industry may be necessary, in fact, to produce, transport, refine and deliver enough to meet oil demands anticipated through March, 1948.

It is particularly important that the industry realize this situation now and do everything possible to prepare for next winter, such as building up stocks and increasing capacity, because there no longer exists an adequate margin to meet an abnormal increase in demand. Protection of the public interest indicates the desirability of high rate of operations until such time as stocks and demonstrated capacity provide reasonable assurance that consumers' needs can be supplied. In this connection it may be noted that a small variation of two percent in demand means over 100,000 b/d, a quantity substantial enough to affect many consumers in the present situation where the industry may not have the capacity to make up a deficit of this magnitude.

The committee has prepared a forecast of demand and supply for the year by quarters. In making this forecast, the probable situation in the first quarter of 1948 has also been taken into account, because the operations this summer are affected by demands for the entire winter of 1947-48. The principal problem indicated by the forecast is that of providing adequate supplies to meet demands.

The committee estimates that the 1947 petroleum demand in the United States, including about 400,000 b/d of exports, will be 5,700,000 b/d, an increase of seven percent over the demand last year. Some allowance has been made for a slight recession in business activity during the latter part of 1947. The effect of a business recession on petroleum demand this year is anticipated to be small because there is generally a lag in the influence of such recession on petroleum demand and because of the upward trend created by new oil-using equipment, such as automobiles, trucks, tractors, diesel engines and oil burners.

If a sharp business recession develops soon or if next winter is warmer than normal, demand may be less than estimated in the present forecast. On the other hand, demand may be higher if business activity continues at present levels or if next winter is unusually cold. The forecast assumes that the weather next winter will be normal and is subject to adjustment in case of colder or warmer weather.

The unprecedented demand during the past winter exceeded even optimistic forecasts because of a number of factors, including the cold weather in the first quarter and the high rate of industrial production. In the first quarter of 1947, demand was about 5,850,000 b/d, about ten percent greater than in the same period of 1946 and five percent above the record demand during the war in the first quarter of 1945. During the past six months, demand was higher than in the preceding six months by 500,000 b/d. This comparison indicates the extent by which peak winter demands exceed summer demands and the necessity for substantial additions to stocks of all oils in summer.

The supply required to meet demand will include, in addition to 5,000,000 b/d of domestic crude oil production for the remainder of the year, about 355,000 b/d of natural gasoline and condensate and 450,000 b/d of imports. Additional crude oil productions may be required if the anticipated volumes of natural gasoline and condensate and imports are not realized. It now appears, however, that if the demands are to be met, particularly for heavy fuel oil, imports will have to remain at a high level.

The committee's forecast indicates an addition to stocks of all oils of about 240,000 b/d during the second and third quarters, a total of 44,000,000 bbls.,

DEMAND AND SUPPLY, 1947

(Thousands of Barrels Daily)

	1947 Forecast					
Demand	**1st Q**	**2nd Q**	**3rd Q**	**4th Q**	**Year**	**Actual 1946**
Gasoline	2015	2380	2420	2255	2267	2138
Kerosene	395	240	215	350	300	268
Distillate Fuel Oil	1110	700	610	960	845	746
Residual Fuel Oil	1540	1355	1265	1450	1403	1333
Other	790	900	960	890	885	836
Total Demand	5850	5575	5470	5905	5700	5321
Supply						
Crude Oil Production	4780	4950	5000	5000	4932	4794
Natural Gasoline	345	350	355	365	355	321
Imports	470	430	440	460	450	370
Total Supply	5595	5730	5795	5825	5737	5440
Stock Change	—255	155	325	—80	37	119
Crude Runs to Stills	4840	4980	5015	5055	4972	4740
Closing Stocks—Million Barrels	484	498	528	521	521	507

in order to build up stocks for the winter of 1947-48. As a result of the reduction in stocks of all oils of 31,500,000 bbls during the past six months, total stocks on March 31, 1947, were about 20,000,000 bbls., or four percent, less than the reasonable level estimated by the committee in its previous report last December. The shortages were especially large in distillate and residual fuel oils.

The difficulties encountered in meeting demands for these products in some areas during March and April constitute evidence in support of the committee's estimates of reasonable stock levels.

The following conclusions summarize some of the principal points of this report:

(1) The petroleum industry is confronted with a record level of demand.

(2) Full use of production, transportation and refining capacities will apparently be required to meet demand, and some unusual measures may be necessary to move sufficient supplies to the Midwest.

(3) The expansion of facilities, which might normally have occurred to keep pace with demand was largely prevented since 1941 because of the war and the shortage of steel. It appears necessary to increase capacity sufficiently to provide a reasonable margin for contingencies in relation to large and growing demands.

(4) The necessity for building up stocks during the summer should be kept in mind by state regulatory agencies and the industry, because the available capacity to refine and transport oil is not adequate to meet demands during the winter.

(5) In the opinion of the committee, domestic crude oil production of about 5,000,000 b/d will be required during the 12 months beginning with April, 1947.

Shell Builds Vacuum Flasher

Construction has just started on a large new vacuum flashing unit at the Shell Oil Co.'s Wood River, Ill., refinery. The new unit will supply additional feed stock for catalytic crackers, enabling them to operate at full capacity. The vacuum flasher will process 35,000 barrels of topped crude oil daily. The flash tower, whose spherical construction makes it the most unusual feature of the unit, will have an inside diameter of 30 feet. A transfer line, carrying oil from the furnaces to the flash tower, will have an inside diameter of four feet, and a mixture of vapor and liquid will flow through it at a velocity of 280 feet per second.

Operating at 770°F. and 60 millimeters, or 1.16 lbs. per square inch, absolute pressure, the new unit will flash 80 percent of the topped crude overhead. Extensive heat economy will be achieved by the use of heat exchange between the products and the crude feed, with over half of the entire heat transfer to the oil being accomplished in the unit. After passing through the heat exchangers, the feed will flow through the furnaces and then through the transfer line to the bottom of the flash vessel. Here it will enter a cyclone type separator which will separate the vapor and liquid.

Since ordinary steel would be subject to severe corrosion in such a unit, all lines and vessels which will be exposed to oil temperatures of 500°F. or over will be made of corrosion resistant chrome molybdenum alloys. The plant is expected to be in operation during the latter part of the year. The C. F. Braun Co. holds the contract for engineering and construction.

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Kellogg Has $80,000,000 Backlog

Geared up for the biggest peacetime year it has ever had, H. R. Austin, president of The M. W. Kellogg Co., has announced that the company's current backlog amounts to more than $80,000,000. "This unprecedented volume is spread through the several divisions of our organization, embracing research, process and mechanical engineering, fabrication and on-site construction," Mr. Austin stated.

In 1945-1946, reversing the usual postwar trend of reducing operations to a prewar level, the company embarked upon further expansion, involving a major investment in new pilot plants, new laboratories and other equipment at the company's plant in Jersey City. The expansion included enlargement of the engineering staff and required additional office space.

"One of the more significant phases of the nation's present industrial expansion," Mr. Austin stated, "is the current modernization program of the oil refining industry, including installation of improved processes and equipment, such as fluid catalytic-cracking, developed during the war. The oil refining industry now is investing huge sums to bring its plants to a new peak of efficiency in all divisions, particularly in those which were held back during the war."

Dresser Joins Santa Fe

The Santa Fe Tank and Tower Co., Los Angeles, has added Harold A. Dresser to its engineering staff. Mr. Dresser, formerly of the Fluor Corp., has taken over the cooling equipment division of Santa Fe. He has been in the cooling equipment industry since 1926. He started with the field construction force, graduating to the engineering department where he took an active part in the general development and experimentation of new type towers.

A new cooling equipment guide has just been published by Santa Fe. It embodies cooling towers, fin units, spray ponds, nozzles, etc. The publication (C.E. 47) includes complete data on all the latest innovations in the cooling equipment industry, plus a wealth of timely information on current cooling problems. Copies are available on request to Santa Fe Tank and Tower Co., 5401 Boyle Avenue, Vernon, Calif.

Socony-Vacuum Refinery Construction

A $45,000,000 modernization and enlargement program at five of its refineries has been announced by W. F. Burt, vice president in charge of manufacturing, Socony-Vacuum Oil Company, Inc. Construction of new units for the manufacturing of lubricating oils is already underway at Paulsboro, N. J., and at the Beaumont, Texas, refinery of the Magnolia Petroleum Co., an affiliated company. Other construction will be at refineries in East St. Louis, Ill., Casper, Wyo., and Augusta, Kan. All the new units are expected to be in operation by Jan. 1, 1949, by which time it is estimated Socony-Vacuum's total refinery throughout will be increased to 475,000 barrels daily.

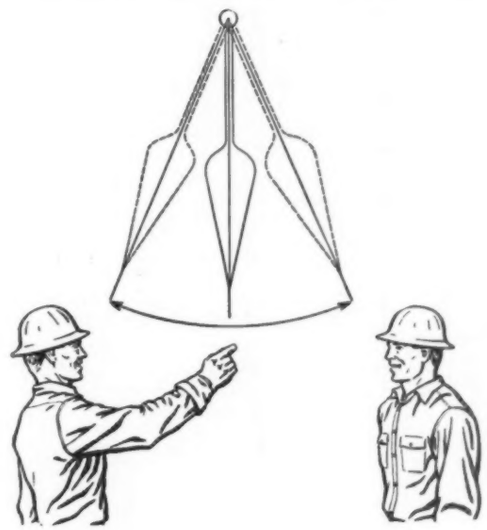
At Paulsboro and Beaumont, construction will include solvent refining units for making lubricating oils and dewaxing plants, power houses and vacuum stills. At the East St. Louis refinery, construction will include a delayed coker and distillation facilities. The Casper refinery, which was first constructed in 1923, will be practically rebuilt and its capacity doubled. It will have a new 5,000-barrel-per-day thermofor catalytic cracking unit, pump house, distillation equipment, water system, office building and truck-loading rack. This refinery manufactures mainly light oils and asphalts. At Augusta the refinery will be enlarged by a 10,000-barrel-per day thermofor for catalytic cracking unit, topping facilities and vacuum stills.

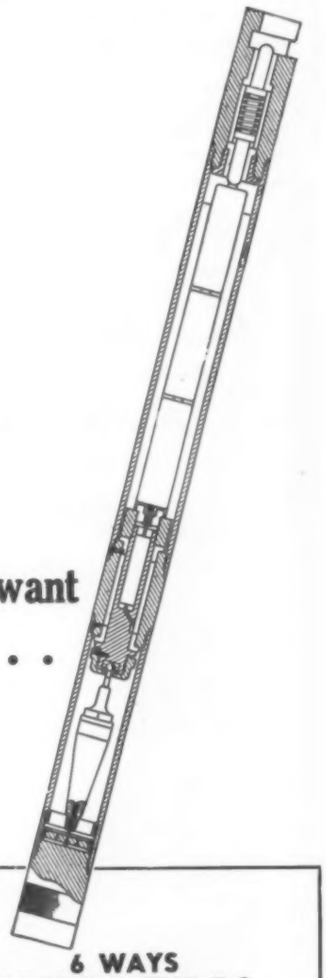
Caltex Extends Market Area

Following the purchase by California Texas Oil Company Ltd. of the marketing subsidiaries of The Texas Company in Europe and North Africa, Caltex has announced the organization of two subordinate companies to coordinate the supply and distribution of its products. Caltex Oceanic Ltd. will handle the principal petroleum products of the Ras Tanura and Bahrein refineries and Caltex Oil Products Company will merchandise lubricating oils, greases, asphalt and other special products.

California Texas is jointly owned by The Texas Company and Standard Oil Company of California through Bahrein Petroleum Company Ltd. Its marketing activities heretofore have been confined to territories east of Suez, but now it will handle the sales activities of the parent companies throughout the Eastern Hemisphere, drawing its supplies mainly from the wells and refineries of Bahrein and Saudi Arabia.

To meet the increased foreign transportation requirements of the Standard-Texas group, Overseas Tankship Corporation was organized in September, 1946, and has arranged for the purchase of a number of T-2 tankers built for the Maritime Commission during the war, several of which are now being delivered. Another member of this group of companies is United Overseas Petroleum Company Ltd. with headquarters in London, which has been organized to handle purchasing and general foreign service for the group. Overall coordination and management of Caltex foreign operations will be directed by California Texas Oil Company, Ltd.





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Italy Plans to Utilize Methane

Because of the acute shortage of coal in Italy, considerable interest attaches to the formation in Rome of the Societa Italo Americano del Metano which proposes to utilize the methane gas of the Po Valley region for fuel purposes. At present the daily output of methane is 1,500,000 cubic meters, but the organizers of the new company, which is backed by American capital, plan to raise this to 15,000,000 cubic meters by drilling to 1,000 meters instead of the 400-500 meters depth of existing wells. Part of the project is the building of a pipe line from Rovigo, where large gas reserves exist, to Brescia, Treviglio and Milan. From Treviglio a branch line will extend to Dalmine and Bergamo. The system will make it possible to serve the larger part of the industrial area of northern Italy. Cost of the project is estimated at five million lire, but it is expected to save the country 7,500,000 tons of coal annually and promote the installation of new type diesel engines designed by Italian manufacturers which can use either oil or methane fuel.

Plan Argentine Plant

Plans for establishment of a truck trailer assembly plant in Argentina are under consideration, it was revealed by R. L. Vaniman, vice president in charge of exports of Fruehauf Trailer Co. He is now in Buenos Aires to discuss the proposal with government officials and prominent Argentine industrialists.

Two New Board Members

W. A. Jenkins and E. P. Jenkins were added to the board of Robert Jenkins & Co., Ltd., Rotherham, England. There are now three grandsons and three great grandsons of Robert Jenkins, J.P., the founder of the firm, on the board. The company manufactures welded steel vessels.

MODERN PETROLEUM TECHNOLOGY. Published 1946 by Institute of Petroleum, London W. 1; 21/s.

This is a book of 466 pages containing 35 separate articles written by 31 experts; the ensemble is intended to present a comprehensive and compact picture of the state of technical knowledge within the industry. The articles deal with exploration for oil and gas, geophysical methods of oil prospecting, drilling, production of oil, refining (10 articles), chemistry of petroleum, utilization (15 articles), distribution and transport (2 articles), oil measurement, significance of tests, and economic features of the petroleum industry. The Institute proposes to keep the book up to date by revised editions from time to time.

B. E. ALVAREZ of the International Division of the A. O. Smith Corp., recently left Milwaukee for a tour of Mexico. It is a business trip in which Alvarez will analyze market conditions in several Mexican trade areas.

Texas Company Fellowship

The Texas Company is establishing an industrial fellowship at Purdue University for study of mass transfer and heat transfer in refining and chemical processes. The fellowship results from the growing importance of processes in which reactants in the gas phase are contacted with a solid catalyst and the need for basic data necessary for the design of equipment for these processes.

Joins Safety Firm

Robert E. Nagel has been elected vice-president of Benson & Associates, Inc., accident prevention firm. Mr. Nagel was associated with Universal Oil Products Company for 25 years as an engineer, and more recently as New York district sales manager of Fluor Corporation, Ltd.

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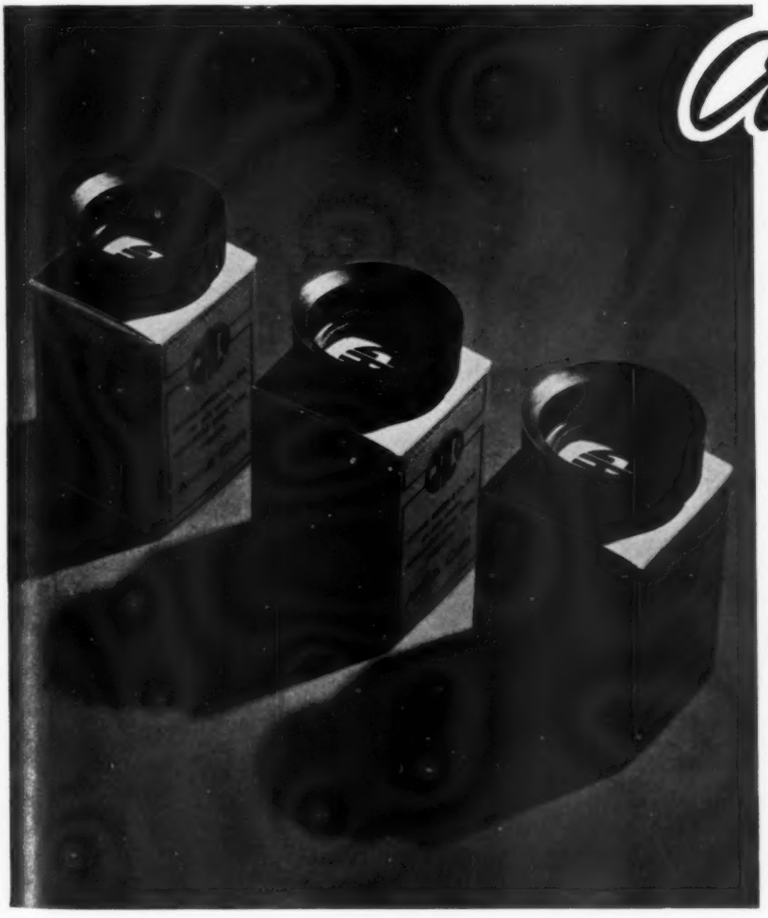

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Opinion Survey Published

The survey of public opinion regarding the oil industry which was conducted last year by Opinion Research Corporation as a basis for the public relations campaign which is now being put under way has been published in a bound volume and is now available for distribution, it is announced by the Public Relations Operating Committee.

The survey, entitled "Those Who Know You Well . . . Think Well of You," summarizes a nation-wide sampling of opinion, revealing the attitude of the general public toward the oil industry, the extent of its information as to the industry's organization and operation and the degree of popular misunderstanding regarding it.

The published volume of 272 pages is divided into three sections: (1) a brief discussion of the most important findings, (2) a summary and analysis of all the results, (3) the complete tabulated returns from all the questions.

The Operating Committee endorses wide distribution of the book to all oil companies and executives, believing that the survey should be of great value to individual companies in their own work, as well as in their participation in the industry program.

Copies of the survey are obtainable from the American Petroleum Institute, 50 West 50th Street, New York 20, New York, at the cost of printing, $4.00 each.

World Tanker Register

Marine department of the Standard Oil Co., (N. J.) has published a new edition of the Register of Tank Vessels of the World. This is the first issue of the register which has been published since the outbreak of the war in 1939, and it thus contains a great number of changes brought about by the conflict.

The status of tanker fleets still is somewhat unsettled due to the continuing transfer of government-owned tankers to private operators under the Merchant Ship Act. Because of this M. G. Gamble, marine department manager has announced that a supplement is being prepared and other such supplements will be issued from time to time so that the register can be kept up to date.

Included in the register is an alphabetical list of owners or managers with the name and tonnage of all ships. In a second section a great deal of data is given about each individual vessel. This includes the builder, date of construction, tonnage, draft, dimensions, cargo capacity, speed, fuel consumption and type of engines. Copies are obtainable from the Standard offices at 30 Rockefeller Plaza, New York 20. Cost is $15 per copy.

Guier Heads Unit Rig

William Guier has been elected president of the Unit Rig & Equipment Co., Tulsa. R. E. Carter was named vice president and F. C. Morton, secretary treasurer. The three were partners in the company prior to the death of J. R. Underwood last year and have purchased the interests of Mrs. Jennie Underwood and H. S. Chancey.

Buys Two Tankers

Purchased from the U. S. Maritime Commission after serving as Navy oilers with the battle fleets, two high-speed tankers are being reconditioned for operation by the Socony-Vacuum Oil Co., Inc., primarily in domestic trade, Socony-Vacuum officials have announced. These vessels will be renamed "Tascalusa" and "Tatarrax" and will bring the Socony-Vacuum fleet under the American flag to a total of 22 tankers practically all built since 1942. Both ships are slightly more than 500 feet long with 68-foot beams and 31-foot loaded draft. Each has a deadweight of 15,910 tons with a capacity of 130,000 barrels and are of 12,000 normal shaft horsepower.

Book On Colombian Petroleum

The Petroleum Economy of Colombia is the title of a book (printed in Spanish) written by Eduardo Ospina-Racines and printed by Editorial Antena, Bogota. In this book, Mr. Ospina, who rates as an outstanding authority on all phases of the petroleum industry of this progressive South American republic, has gathered together a number of his articles and papers on the Colombian oil industry published since 1940. These collected papers cover a wide range of legal, economic and technical subjects on which every person interested in Colombian petroleum may need information particularly as regards the status of private rights in the exploration and exploitation of oil.

Fowler Elected GATX Director

Walter W. Fowler, vice president of General American Transportation Corporation in charge of export activities, has been elected to the directorate of the company following action at the annual meeting increasing membership from eleven to twelve. All directors previously serving were reelected.

Bahrein Production

Bahrein Petroleum Company's production of crude oil for the first quarter of 1947 amounted to 2,206,411 barrels, an average of 24,516 barrels daily.

Ballagh on European Trip

J. C. Ballagh, president of Patterson-Ballagh division of Byron Jackson Co., Los Angeles, is on a six weeks business trip in England and the European continent from which he is expected to return at the end of June.

Deepest Producing Well

At the time of its completion in April last, Shell Oil Company's well in the Weeks Island, Louisiana field, known as Smith-State Unit 1, No. 3, established a record as the world's deepest producing oil well. It was drilled to a depth of 14,395 feet but was plugged back to a zone extending from 13,867 to 13,888 feet. Initial production from that level was 502 barrels daily through a 10/64-in. choke. No. 3 took over the deep well title from its companion, No. 2, in the same field, which lacked 104 feet of attaining an equal depth.

Shell Presents New Type Motion Picture

Under the title, "This Is Oil," a series of six full-color films has been prepared by Shell Oil Company. The pictures are intended to convey in simple visual form the essential facts about the finding, processing and distribution of petroleum. They are designed to be shown before schools, clubs and other organizations made up of persons not technically informed. The first of the series, entitled, "Prospecting for Petroleum," illustrates the types of rock formations in which oil is found and the scientific methods developed to aid in its location. Miniature figures enliven the scenes and provide an animated effect unattainable by the photographing of flat drawings. The film, which runs for about 22 minutes, required something like 100,000 exposures to meet technicolor requirements and engaged the highest skill of motion picture mechanics. It will be followed by other films depicting oil production, transportation, refining and research activities.